MSP430 Hardware Tools

User's Guide

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Read This First

About This Manual

This manual describes the hardware of the Texas Instruments MSP-FET430 Flash Emulation Tool (FET). The FET is the program development tool for the MSP430 ultralow-power microcontroller. Both available interface types, the parallel port interface and the USB interface, are described.

How to Use This Manual

Read and follow the instructions in Chapter 1. This chapter lists the contents of the FET, provides instructions on installing the hardware and according software drivers. After you see how quick and easy it is to use the development tools, TI recommends that you read all of this manual.

This manual describes the setup and operation of the FET but does not fully describe the MSP430™ microcontrollers or the development software systems. For details of these items, see the appropriate TI documents listed in Section 1.19.

This manual applies to the following tools (and devices):

- MSP-FET430PIF (debug interface with parallel port connection, for all MSP430 flash-based devices)
- MSP-FET430UIF (debug interface with USB connection, for all MSP430 flash-based devices)
- eZ430-F2013 (USB stick form factor interface with attached MSP430F2013 target, for all MSP430F20xx, MSP430G2x01, MSP430G2x11, MSP430G2x21, and MSP430G2x31 devices)
- eZ430-T2012 (three MSP430F2012 based target boards)
- eZ430-RF2500 (USB stick form factor interface with attached MSP430F2274 and CC2500 target, for all MSP430F20xx, MSP430F21x2, MSP430F22xx, MSP430G2x01, MSP430G2x11, MSP430G2x21, and MSP430G2x31 devices)
- eZ430-RF2500T (one MSP430F2274 and CC2500 target board including battery pack)
- eZ430-RF2500-SEH (USB stick form factor interface with attached MSP430F2274 and CC2500 target and solar energy harvesting module)
- eZ430-Chronos-xxx (USB stick form factor interface with CC430F6137 based development system contained in a watch. Includes <1 GHz RF USB access point)

The following tools contain the USB debug interface (MSP-FET430UIF) and the respective target socket module:

- MSP-FET430U8 (for MSP430G2210 and MSP430G2230 devices in 8-pin D packages) (green PCB)
- MSP-FET430U14 (for MSP430F20xx, MSP430F20xx, MSP430G2x01, MSP430G2x11, MSP430G2x21, and MSP430G2x31 devices in 14-pin PW packages) (green PCB)
- MSP-FET430U092 (for MSP430FL092 devices in 14-pin PW packages) (green PCB)
- MSP-FET430U24 (for MSP430AFE2xx devices in 24-pin PW packages) (green PCB)
- MSP-FET430U28 (for MSP430F11xx(A) devices in 20- and 28-pin DW or PW packages)
- MSP-FET430U28A (for MSP430F20xx and MSP430G2xxx devices in 14-, 20-, and 28-pin PW)
- MSP-FET430U38 (for MSP430F22x2 and MSP430F22x4 devices in 38-pin DA packages)
- MSP-FET430U23x0 (for MSP430F23x0 devices in 40-pin RHA packages)
- MSP-FET430U40 (for MSP430F51x1, MSP430F51x2 devices in 40-pin RSB packages)
- MSP-FET430U40A (for MSP430FR572x, MSP430FR573x devices in 40-pin RHA packages)
- MSP-FET430U48 (for MSP430F22x2 and MSP430F22x4 devices in 48-pin DL packages)
- MSP-FET430U48B (for MSP430F534x devices in 48-pin RGZ packages)

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- MSP-FET430U48C (for MSP430FR58xx and MSP430FR59xx devices in 48-pin RGZ packages)
- MSP-FET430U64 (for MSP430F13x, MSP430F14x, MSP430F14x1, MSP430F15x, MSP430F16x(1), MSP430F23x, MSP430F24x, MSP430F24xx, MSP430F261x, MSP430F41x, MSP430F42x(A), MSP430FE42x(A), MSP430FE42x2, and MSP430FW42x devices in 64-pin PM packages)
- MSP-FET430U64A (for MSP430F41x2 devices in 64-pin PM packages) (red PCB)
- MSP-FET430U64B (for MSP430F530x devices in 64-pin RGC packages) (blue PCB)
- MSP-FET430U64C (for MSP430F522x and MSP430F521x devices in 64-pin RGC packages) (black PCB)
- MSP-FET430U64USB (for MSP430F550x, MSP430F551x, MSP430552x, devices in 64-pin RGC packages)
- MSP-FET430U80 (for MSP430F241x, MSP430F261x, MSP430F43x, MSP430F43x1, MSP430FG43x, MSP430F47x, and MSP430FG47x devices in 80-pin PN packages)
- MSP-FET430U80A (for MSP430F532x devices in 80-pin PN packages)
- MSP-FET430U80USB (for MSP430F552x devices with USB peripheral in 80-pin PN packages)
- MSP-FET430U100 (for MSP430F43x, MSP430F43x1, MSP430F44x, MSP430FG461x, and MSP430F47xx devices in 100-pin PZ packages)
- MSP-FET430U100A (for MSP430F471xx devices in 100-pin PZ packages) (red PCB)
- MSP-FET430U100B (for MSP430F67xx devices in 100-pin PZ packages) (blue PCB)
- MSP-FET430U100C (for MSP430F643x and MSP430F533x devices in 100-pin PZ packages) (black PCB)
- MSP-FET430U5x100 (for MSP430F54xx(A) devices and MSP430BT5190 in 100-pin PZ packages) (green PCB)
- MSP-FET430U100USB (for MSP430F663x and MSP430F563x devices in 100-pin PZ packages) (green PCB)
- MSP-FET430U128 (for MSP430F67xx and MSP430F67xx1 devices in 128-pin PEU packages) (green PCB)
- FET430F5137RF900 (for CC430F513x devices in 48-pin RGZ packages) (green PCB)
- FET430F6137RF900 (for CC430F612x and CC430F613x devices in 64-pin RGC packages) (green PCB)

Stand-alone target-socket modules (without debug interface):

- MSP-TS430D8 (for MSP430G2210 and MSP430G2230 devices in 8-pin D packages) (green PCB)
- MSP-TS430PW14 (for MSP430F20xx, MSP430G2x01, MSP430G2x11, MSP430G2x21 and MSP430G2x31 devices in 14-pin PW packages) (green PCB)
- MSP-TS430L092 (for MSP430FL092 devices in 14-pin PW packages) (green PCB)
- MSP-TS430PW24 (for MSP430AFE2xx devices in 24-pin PW packages) (green PCB)
- MSP-TS430DW28 (for MSP430F11xx(A) devices in 28-pin DW packages) (green PCB)
- MSP-TS430PW28 (for MSP430F11xx(A) devices in 28-pin PW packages) (green PCB)
- MSP-TS430PW28A (for MSP430F20xx and MSP430G2xxx devices in 14, 20, and 28-pin PW) (red PCB)
- MSP-TS430DA38 (for MSP430F22x2 and MSP430F22x4 devices in 38-pin DA packages) (green PCB)
- MSP-TS430QFN23x0 / MSP-TS430QFN40 (for MSP430F23x0 devices in 40-pin RHA packages) (green PCB)
- MSP-TS430RSB40 (for MSP430F51x1, MSP430F51x2 devices in 40-pin RSB packages) (green PCB)
- MSP-TS430RHA40A (for MSP430FR572x, MSP430FR573x devices in 40-pin RHA packages) (red PCB)
- MSP-TS430DL48 (for MSP430F22x2 and MSP430F22x4 devices in 48-pin DL packages) (green PCB)
- MSP-TS430RGZ48B (for MSP430F534x devices in 48-pin RGZ packages) (blue PCB)
- MSP-TS430RGZ48C (for MSP430FR58xx and MSP430FR59xx devices in 48-pin RGZ packages) (black PCB)

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- MSP-TS430PM64 (for MSP430F13x, MSP430F14x, MSP430F14x1, MSP430F15x, MSP430F16x(1), MSP430F23x, MSP430F24x, MSP430F24xx, MSP430F261x, MSP430F41x, MSP430F42x(A), MSP430FE42x(A), MSP430FE42x2, and MSP430FW42x devices in 64-pin PM packages) (green PCB)
- MSP-TS430PM64A (for MSP430F41x2 devices in 64-pin PM packages) (red PCB)
- MSP-TS430RGC64B (for MSP430F530x devices in 64-pin RGC packages) (blue PCB)
- MSP-TS430RGC64C (for MSP430F522x and MSP430F521x devices in 64-pin RGC packages) (black PCB)
- MSP-TS430RGC64USB (for MSP430F550x, MSP430F551x, MSP430F552x, devices in 64-pin RGC packages) (green PCB)
- MSP-TS430PN80 (for MSP430F241x, MSP430F261x, MSP430F43x, MSP430F43x1, MSP430FG43x, MSP430F47x, and MSP430FG47x devices in 80-pin PN packages) (green PCB)
- MSP-TS430PN80A (for MSP430F532x devices in 80-pin PN packages) (red PCB)
- MSP-TS430PN80USB (for MSP430F551x and MSP430F552x devices with USB peripheral in 80-pin PN packages) (green PCB)
- MSP-TS430PZ100 (for MSP430F43x, MSP430F43x1, MSP430F44x, MSP430FG461x, and MSP430F47xx devices in 100-pin PZ packages) (green PCB)
- MSP-TS430PZ100A (for MSP430F471xx devices in 100-pin PZ packages) (red PCB)
- MSP-FET430PZ100B (for MSP430F67xx devices in 100-pin PZ packages) (blue PCB)
- MSP-TS430PZ100C (for MSP430F643x and MSP430F533x devices in 100-pin PZ packages) (black PCB)
- MSP-TS430PZ5x100 (for MSP430F54xx(A) and the MSP430BT5190 devices in 100-pin PZ packages) (green PCB)
- MSP-TS430PZ100USB (for MSP430F663x and MSP430F563x devices in 100-pin PZ packages) (green PCB)
- MSP-TS430PEU128 (for MSP430F67xx and MSP430F67xx1 devices in 128-pin PEU packages) (green PCB)
- EM430F5137RF900 (with integrated CC430F5137 IC in a 48-pin RGZ package) (green PCB)
- EM430F6137RF900 (with integrated CC430F6137 IC in a 64-pin RGC package) (green PCB)
- EM430F6147RF900 (with integrated CC430F6147 IC in a 64-pin RGC package) (red PCB)

These tools contain the most up-to-date materials available at the time of packaging. For the latest materials (data sheets, user's guides, software, application information, etc.), visit the TI MSP430 web site at www.ti.com/msp430 or contact your local TI sales office.

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Information About Cautions and Warnings

This document may contain cautions and warnings.

CAUTION

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

WARNING

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

The information in a caution or a warning is provided for your protection. Read each caution and warning carefully.

Related Documentation From Texas Instruments

MSP430 development tools documentation:

CCS for MSP430 User's Guide (literature number SLAU157)

Code Composer Studio v5.x Core Edition (CCS Mediawiki)

IAR for MSP430 User's Guide (literature number SLAU138)

IAR Embedded Workbench KickStart (literature number SLAC050)

eZ430-F2013 Development Tool User's Guide (literature number SLAU176)

eZ430-RF2480 User's Guide (literature number SWRA176)

eZ430-RF2500 Development Tool User's Guide (literature number SLAU227)

eZ430-RF2500-SEH Development Tool User's Guide (literature number SLAU273)

eZ430-Chronos Development Tool User's Guide (literature number SLAU292)

Sub-1 GHz RF Spectrum Analyzer Tool (literature number SLAU371)

MSP430F5529 USB Experimenter's Board, MSP-EXP430F5529 (literature number SLAU330)

MSP430F5438 Experimenter Board, MSP-EXP430F5438 (literature number SLAU263)

MSP430 LaunchPad Value Line Development kit, MSP-EXP430G2 (literature number SLAU318)

MSP430 device user's guides:

MSP430x1xx Family User's Guide (literature number SLAU049)

MSP430x2xx Family User's Guide (literature number SLAU144)

MSP430x3xx Family User's Guide (literature number SLAU012)

MSP430x4xx Family User's Guide (literature number SLAU056)

MSP430x5xx and MSP430x6xx Family User's Guide (literature number SLAU208)

CC430 Family User's Guide (literature number SLAU259)

MSP430FR57xx Family User's Guide (literature number SLAU272)

MSP430FR58xx and MSP430FR59xx Family User's Guide (literature number SLAU367)

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If You Need Assistance

Support for the MSP430 devices and the FET development tools is provided by the Texas Instruments Product Information Center (PIC). Contact information for the PIC can be found on the TI web site at www.ti.com/support. The Texas Instruments E2E Community support forums for the MSP430 provide open interaction with peer engineers, TI engineers, and other experts. Additional device-specific information can be found on the MSP430 web site.

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Get Started Now!

This chapter lists the contents of the FET and provides instruction on installing the hardware.

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1.1 Flash Emulation Tool (FET) Overview

TI offers several flash emulation tools according to different requirements.

Table 1-1. Flash Emulation Tool (FET) Features and Device Compatibility[1]

	eZ430-F2013	eZ430-RF2500	eZ430-RF2480	eZ430-RF2560	MSP-WDSxx Metawatch	eZ430-Chronos	MSP-FET430PIF	MSP-FET430UIF	LaunchPad (MSP-EXP430G2)	MSP-EXP430FR5739	MSP-EXP430F5529
Supports all MSP430 and CC430 flash-based devices (F1xx, F2xx, F4xx, F5xx, F6xx, G2xx, L092, FR57xx)							x	x			
Supports only F20xx, G2x01, G2x11, G2x21, G2x31	x										
Supports MSP430F20xx, F21x2, F22xx, G2x01, G2x11, G2x21, G2x31, G2x53									x		
Supports MSP430F20xx, F21x2, F22xx, G2x01, G2x11, G2x21, G2x31		x	x								
Supports F5438, F5438A				x							
Supports BT5190, F5438A					x						
Supports only F552x											x
Supports FR57xx, F5638, F6638										x	
Supports only CC430F613x						x					
Allows fuse blow								x			
Adjustable target supply voltage								x			
Fixed 2.8-V target supply voltage							x				
Fixed 3.6-V target supply voltage	x	x	x	x	x	x			x	x	x
4-wire JTAG							x	x			
2-wire JTAG[2]	x	x	x	x	x	x		x	x	x	x
Application UART		x	x	x	x	x			x	x	x
Supported by CCS for Windows	x	x	x	x	x	x	x	x	x	x	x
Supported by CCS for Linux								x			
Supported by IAR	x	x	x	x	x	x	x	x	x	x	x

(1) The MSP-FET430PIF is for legacy device support only. This emulation tool will not support any new devices released after 2011.
(2) The 2-wire JTAG debug interface is also referred to as Spy-Bi-Wire (SBW) interface.

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1.2 Kit Contents, MSP-FET430PIF

- One READ ME FIRST document
- One MSP-FET430PIF interface module
- One 25-conductor cable
- One 14-conductor cable

NOTE: This part is obsolete and is not recommended to use in new design.

1.3 Kit Contents, eZ430-F2013

- One QUICK START GUIDE document
- One eZ430-F2013 development tool including one MSP430F2013 target board

1.4 Kit Contents, eZ430-T2012

- Three MSP430F2012-based target boards

1.5 Kit Contents, eZ430-RF2500

- One QUICK START GUIDE document
- One eZ430-RF2500 CD-ROM
- One eZ430-RF2500 development tool including one MSP430F2274 and CC2500 target board
- One eZ430-RF2500T target board
- One AAA battery pack with expansion board (batteries included)

1.6 Kit Contents, eZ430-RF2500T

- One eZ430-RF2500T target board
- One AAA battery pack with expansion board (batteries included)

1.7 Kit Contents, eZ430-RF2500-SEH

- One MSP430 development tool CD containing documentation and development software
- One eZ430-RF USB debugging interface
- Two eZ430-RF2500T wireless target boards
- One SEH-01 solar energy harvester board
- One AAA battery pack with expansion board (batteries included)

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1.8 Kit Contents, eZ430-Chronos-xxx

'433, '868, '915

- One QUICK START GUIDE document
- One ez430-Chronos emulator
- One screwdriver
- Two spare screws

  eZ430-Chronos-433:

  – One 433-MHz eZ430-Chronos watch (battery included)

  – One 433-MHz eZ430-Chronos access point

  eZ430-Chronos-868:

  – One 868-MHz eZ430-Chronos watch (battery included)

  – One 868-MHz eZ430-Chronos access point

  eZ430-Chronos-915:

  – One 915-MHz eZ430-Chronos watch (battery included)

  – One 915-MHz eZ430-Chronos access point

1.9 Kit Contents, MSP-FET430UIF

- One READ ME FIRST document
- One MSP-FET430UIF interface module
- One USB cable
- One 14-conductor cable

1.10 Kit Contents, MSP-FET430xx

'U8, 'U14, 'U092, 'U24, 'U28, 'U28A, 'U38, 'U23x0, 'U40, 'U40A, 'U48, 'U48B, 'U64, 'U64A, 'U64B, 'U64C, 'U64USB, 'U80, 'U80USB, 'U100, 'U100A, 'U100B, 'U100C, 'U5x100, 'U100USB, 'U128

- One READ ME FIRST document
- One MSP-FET430UIF USB interface module. This is the unit that has a USB B-connector on one end of the case, and a 2×7-pin male connector on the other end of the case.
- One USB cable
- One 32.768-kHz crystal from Micro Crystal (except MSP-FET430U24)
- A 2×7-pin male JTAG connector is also present on the PCB (see different setup for L092)
- One 14-Pin JTAG conductor cable
- One small box containing two MSP430 device samples (See table for Sample Type)
- One target socket module. To check the devices used for each board and a summary of the board, see Table 1-2. MSP-TS430xx below is the target socket module for each MSP-FET430Uxx kit.

  MSP-FET430U8: One **MSP-TS430D8** target socket module.

  MSP-FET430U14: One **MSP-TS430PW14** target socket module.

  MSP-FET430U092: One **MSP-TS430L092** target socket module with Active Cable.

  MSP-FET430U24: One **MSP-TS430PW24** target socket module.

  MSP-FET430U28: One **MSP-TS430PW28** target socket module.

  MSP-FET430U28A: One **MSP-TS430PW28A** target socket module.

  MSP-FET430U38: One **MSP-TS430DA38** target socket module..

  MSP-FET430U23x0: One **MSP-TS430QFN23x0** (former name MSP-TS430QFN40) target socket module.

  MSP-FET430U40: One **MSP-TS430RSB40** target socket module.

  MSP-FET430U48: One **MSP-TS430DL48** target socket module.

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MSP-FET430U48B: One **MSP-TS430RGZ48B** target socket module.
MSP-FET430U48C: One **MSP-TS430RGZ48C** target socket module.
MSP-FET430U64: One **MSP-TS430PM64** target socket module.
MSP-FET430U64A: One **MSP-TS430PM64A** target socket module.
MSP-FET430U64B: One **MSP-TS430RGC64B** target socket module.
MSP-FET430U64C: One **MSP-TS430RGC64C** target socket module.
MSP-FET430U64USB: One **MSP-TS430RGC64USB** target socket module.
MSP-FET430U80: One **MSP-TS430PN80** target socket module.
MSP-FET430U80A: One **MSP-TS430PN80A** target socket module.
MSP-FET430U80USB: One **MSP-TS430PN80USB** target socket module.
MSP-FET430U100: One **MSP-TS430PZ100** target socket module.
MSP-FET430U100A: One **MSP-TS430PZ100A** target socket module.
MSP-FET430U100B: One **MSP-TS430PZ100B** target socket module.
MSP-FET430U100C: One **MSP-TS430PZ100C** target socket module.
MSP-FET430U5x100: One **MSP-TS430PZ5x100** target socket module.
MSP-FET430U100USB: One **MSP-TS430PZ100USB** target socket module.
MSP-FET430U128: One **MSP-TS430PEU128** target socket module.

Consult the device data sheets for device specifications. Device errata can be found in the respective device product folder on the web provided as a PDF document. Depending on the device, errata may also be found in the device bug database at www.ti.com/sc/cgi-bin/buglist.cgi.

1.11 Kit Contents, FET430F6137RF900

- One READ ME FIRST document
- One legal notice
- One MSP-FET430UIF interface module
- Two EM430F6137RF900 target socket modules. This is the PCB on which is soldered a CC430F6137 device in a 64-pin RGC package. A 2×7-pin male connector is also present on the PCB
- Two CC430EM battery packs
- Four AAA batteries
- Two 868-MHz or 915-MHz antennas
- Two 32.768-kHz crystals
- 18 PCB 2x4-pin headers
- One USB cable
- One 14-pin JTAG conductor cable

1.12 Kit Contents, Sub-1 GHz RF Spectrum Analyzer Tool (MSP-SA430-SUB1GHZ)

- MSP-SA430-SUB1GHZ Spectrum Analyzer
- Antenna
- USB cable
- CD with a Microsoft Windows Graphical User Interface (GUI) and documentation
- Quick start guide

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1.13 Kit Contents, MSP-TS430xx

'D8, 'PW14, 'L092, 'PW24, 'DW28, 'PW28, 'PW28A, 'DA38, 'QFN32x0, 'RSB40, 'DL48, 'RGZ48B, 'RGZ48C, 'PM64, 'PM64A, 'RGC64B, 'RGC64C, 'RGC64USB, 'PN80, 'PN80A, 'PN80USB, 'PZ100, 'PZ100A, 'PZ100B, 'PZ100C, 'PZ5x100, 'PZ100USB, 'PEU128

- One READ ME FIRST document
- One 32.768-kHz crystal from Micro Crystal (except MSP-TS430PW24)
- One target socket module
- A 2×7-pin male JTAG connector is also present on the PCB (see different setup for L092)
- One small box containing two MSP430 device samples (see Table 1-2 for sample type)

Table 1-2. Individual Kit Contents, MSP-TS430xx

Target Socket Module	Socket Type	Supported Devices	Included Devices	Headers and Comment
MSP-TS430D8	8-pin D (TSSOP ZIF)	MSP430G2210, G2230	1 x MSP430G2210 and 1 x MSP430G2230	Two PCB 1×4-pin headers (two male and two female)
MSP-TS430PW14	14-pin PW (TSSOP ZIF)	MSP430F20xx, G2x01, G2x11, G2x21, G2x31	2 x MSP430F2013IPW	Four PCB 1×7-pin headers (two male and two female)
MSP-TS430L092	14-pin PW (TSSOP ZIF)	MSP-TS430L092	2 x MSP430L092IPW	Four PCB 1×7-pin headers (two male and two female). A "Micro-MaTch" 10-pin female connector is also present on the PCB which connects the kit with an 'Active Cable' PCB; this 'Active Cable' PCB is connected by 14 pin JTAG cable with the FET430UIF
MSP-TS430PW24	24-pin PW (TSSOP ZIF)	MSP430AFE2xx	2 x MSP430AFE253IPW	Four PCB 1×12-pin headers (two male and two female)
MSP-TS430DW28	28-pin DW (SSOP ZIF)	MSP430F11x1, F11x2, F12x F12x2 F21xx. Supports devices in 20- and 28-pin DA packages	2 x MSP430F123IDW	Four PCB 1×12-pin headers (two male and two female)
MSP-TS430PW28	28-pin PW (TSSOP ZIF)	MSP430F11x1, F11x2, F12x, F12x2, F21xx	2 x MSP430F2132IPW	Four PCB 1×12-pin headers (two male and two female)
MSP-TS430PW28A	28-pin PW (TSSOP ZIF)	MSP430F20xx, MSP430G2xxx in 14-, 20-, and 28-pin PW packages	2 x MSP430G2452IPW20	Four PCB 1×12-pin headers (two male and two female)
MSP-TS430DA38	38-pin DA (TSSOP ZIF)	MSP430F22xx	2 x MSP430F2274IDA	Four PCB 1×19-pin headers (two male and two female)
MSP-TS430QFN23x0	40-pin RHA (QFN ZIF)	MSP430F23x0	2 x MSP430F2370IRHA	Eight PCB 1×10-pin headers (four male and four female)
MSP-TS430RSB40	40-pin RSB (QFN ZIF)	MSP430F51x1, F51x2	2 x MSP430F5172IRSB	Eight PCB 1×10-pin headers (four male and four female)
MSP-TS430RHA40A	40-pin RHA (QFN ZIF)	MSP430FR572x, FR573x	2 x MSP430FR5739IRHA	Eight PCB 1×10-pin headers (four male and four female)
MSP-TS430DL48	48-pin DL (TSSOP ZIF)	MSP430F42x0	2 x MSP430F4270IDL	Four PCB 2×12-pin headers (two male and two female)
MSP-TS430RGZ48B	48-pin RGZ (QFN ZIF)	MSP430F534x	2 x MSP430F5342IRGZ	Eight PCB 1×12-pin headers (four male and four female)
MSP-TS430RGZ48C	48-pin RGZ (QFN ZIF)	MSP430FR58xx and MSP430FR59xx	2 x MSP430FR5969IRGZ	Eight PCB 1×12-pin headers (four male and four female)
MSP-TS430PM64	64-pin PM (QFP ZIF)	MSP430F13x, F14x, F14x1, F15x, F16x(1), F23x, F24x, F24xx, F261x, F41x, F42x(A), FE42x(A), FE42x2, FW42x	TS Kit: 2 x MSP430F2618IPM; FET Kit: 2 x MSP430F417IPM and 2 x MSP430F169IPM	Eight PCB 1×16-pin headers (four male and four female)
MSP-TS430PM64A	64-pin PM (QFP ZIF)	MSP430F41x2	2 x MSP430F4152IPM	Eight PCB 1×16-pin headers (four male and four female)
MSP-TS430RGC64B	64-pin RGC (QFN ZIF)	MSP430F530x	2 x MSP430F5310IRGC	Eight PCB 1×16-pin headers (four male and four female)
MSP-TS430RGC64C	64-pin RGC (QFN ZIF)	MSP430F522x, F521x	2 x MSP430F5229IRGC	Eight PCB 1×16-pin headers (four male and four female)
MSP-TS430RGC64USB	64-pin RGC (QFN ZIF)	MSP430F550x, F551x, F552x	2 x MSP430F5510IRGC or 2 x MSP430F5528IRGC	Eight PCB 1×16-pin headers (four male and four female)
MSP-TS430PN80	80-pin PN (QFP ZIF)	MSP430F241x, F261x, F43x, F43x1, FG43x, F47x, FG47x	2 x MSP430FG439IPN	Eight PCB 1×20-pin headers (four male and four female)

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Table 1-2. Individual Kit Contents, MSP-TS430xx (continued)

Target Socket Module	Socket Type	Supported Devices	Included Devices	Headers and Comment
MSP-TS430PN80A	80-pin PN (QFP ZIF)	MSP430F532x	2 x MSP430F5329IPN	Eight PCB 1×20-pin headers (four male and four female)
MSP-TS430PN80USB	80-pin PN (QFP ZIF)	MSP430F552x, F551x	2 x MSP430F5529IPN	Eight PCB 1×20-pin headers (four male and four female)
MSP-TS430PZ100	100-pin PZ (QFP ZIF)	MSP430F43x, F43x1, F44x, FG461x, F47xx	2 x MSP430FG4619IPZ	Eight PCB 1×25-pin headers (four male and four female)
MSP-TS430PZ100A	100-pin PZ (QFP ZIF)	MSP430F471xx	2 x MSP430F47197IPZ	Eight PCB 1×25-pin headers (four male and four female)
MSP-TS430PZ100B	100-pin PZ (QFP ZIF)	MSP430F67xx	2 x MSP430F6733IPZ	Eight PCB 1×25-pin headers (four male and four female)
MSP-TS430PZ100C	100-pin PZ (QFP ZIF)	MSP430F645x, F643x, F535x, F533x	2 x MSP430F6438IPZ	Eight PCB 1×25-pin headers (four male and four female)
MSP-TS430PZ5x100	100-pin PZ (QFP ZIF)	MSP430F543x, MSP430BT5190, MSP430SL5438A	2 x MSP430F5438IPZ	Eight PCB 1×25-pin headers (four male and four female)
MSP-TS430PZ100USB	100-pin PZ (QFP ZIF)	MSP430F665x, F663x, F563x	2 x MSP430F6638IPZ	Eight PCB 1×25-pin headers (four male and four female)
MSP-TS430PEU128	128-pin PEU (QFP ZIF)	MSP430F677x, F676x, F674x, F677x1, F676x1, F674x1	2 x MSP430F67791IPEU	Four PCB 1x26-pin headers (two male and two female) and four PCB 1x38-pin headers (two male and two female)

See the device data sheets for device specifications. Device errata can be found in the respective device product folder on the web provided as a PDF document. Depending on the device, errata may also be found in the device bug database at www.ti.com/sc/cgi-bin/buglist.cgi.

1.14 Kit Contents, EM430Fx1x7RF900

- One READ ME FIRST document
- One legal notice
- Two target socket module

  MSP-EM430F5137RF900: Two EM430F5137RF900 target socket modules. This is the PCB on which is soldered a CC430F5137 device in a 48-pin RGZ package. A 2×7-pin male connector is also present on the PCB

  MSP-EM430F6137RF900: Two EM430F6137RF900 target socket modules. This is the PCB on which is soldered a CC430F6137 device in a 64-pin RGC package. A 2×7-pin male connector is also present on the PCB

  MSP-EM430F6147RF900: Two EM430F6147RF900 target socket modules. This is the PCB on which is soldered a CC430F6147 device in a 64-pin RGC package. A 2×7-pin male connector is also present on the PCB
- Two CC430EM battery packs
- Four AAA batteries
- Two 868- or 915-MHz antennas
- Two 32.768-kHz crystals
- 18 PCB 2×4-pin headers

1.15 Hardware Installation, MSP-FET430PIF

Follow these steps to install the hardware for the MSP-FET430PIF tools:

1. Use the 25-conductor cable to connect the FET interface module to the parallel port of the PC. The necessary driver for accessing the PC parallel port is installed automatically during CCS or IAR Embedded Workbench installation. Note that a restart is required after the CCS or IAR Embedded Workbench installation for the driver to become active.
2. Use the 14-conductor cable to connect the parallel-port debug interface module to a target board, such as an MSP-TS430xxx target socket module. Module schematics and PCBs are shown in Appendix B.

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1.16 Hardware Installation, MSP-FET430UIF

Follow these steps to install the hardware for the MSP-FET430UIF tool:

1. Install the IDE (CCS or IAR) you plan to use before connecting USB-FET interface to PC. The IDE installation installs drivers automatically.
2. Use the USB cable to connect the USB-FET interface module to a USB port on the PC. The USB FET should be recognized, as the USB device driver is installed automatically. If the driver has not been installed yet, the install wizard starts. Follow the prompts and point the wizard to the driver files.

   The default location for CCS is c:\ti\ccsv5\ccs_base\emulation\drivers\msp430\USB_CDC or c:\ti\ccsv5\ccs_base\emulation\drivers\msp430\USB_FET_XP_XX, depending of firmware version of the tool.

   The default location for IAR Embedded Workbench is <Installation Root>\Embedded Workbench x.x\430\drivers\TIUSBFET\eZ430-UART or <Installation Root>\Embedded Workbench x.x\430\drivers\<Win_OS>, depending of firmware version of the tool.

   The USB driver is installed automatically. Detailed driver installation instructions can be found in Appendix C.
3. After connecting to a PC, the USB FET performs a self-test during which the red LED may flash for approximately two seconds. If the self-test passes successfully, the green LED stays on.
4. Use the 14-conductor cable to connect the USB-FET interface module to a target board, such as an MSP-TS430xxx target socket module.
5. Ensure that the MSP430 device is securely seated in the socket, and that its pin 1 (indicated with a circular indentation on the top surface) aligns with the "1" mark on the PCB.
6. Compared to the parallel-port debug interface, the USB FET has additional features including JTAG security fuse blow and adjustable target V_{CC} (1.8 V to 3.6 V). Supply the module with up to 60 mA.

1.17 Hardware Installation, eZ430-XXXX, MSP-EXP430G2, MSP-EXP430FR5739, MSP-EXP430F5529

To install eZ430-XXXX, MSP-EXP430G2, MSP-EXP430FR5739, MSP-EXP430F5529 tools follow instructions 1 and 2 of Section 1.16

1.18 Hardware Installation, MSP-FET430Uxx, MSP-TS430xxx, FET430F6137RF900, EM430Fx137RF900

Follow these steps to install the hardware for the MSP-FET430Uxx and MSP-TS430xxx tools:

1. Follow instructions 1 and 2 of Section 1.16
2. Connect the MSP-FET430PIF or MSP-FET430UIF debug interface to the appropriate port of the PC. Use the 14-conductor cable to connect the FET interface module to the supplied target socket module.
3. Ensure that the MSP430 device is securely seated in the socket and that its pin 1 (indicated with a circular indentation on the top surface) aligns with the "1" mark on the PCB.
4. Ensure that the two jumpers (LED and VCC) near the 2×7-pin male connector are in place. Illustrations of the target socket modules and their parts are found in Appendix B.

1.19 Important MSP430 Documents on the Web

The primary sources of MSP430 information are the device-specific data sheet and user's guide. The MSP430 web site (www.ti.com/msp430) contains the most recent version of these documents.

PDF documents describing the CCS tools (CCS IDE, the assembler, the C compiler, the linker, and the librarian) are in the msp430\documentation folder. A Code Composer Studio specific Wiki page (FAQ) is available, and the Texas Instruments E2E Community support forums for the MSP430 and Code Composer Studio v5 provide additional help besides the product help and Welcome page.

PDF documents describing the IAR tools (Workbench C-SPY, the assembler, the C compiler, the linker, and the librarian) are in the common\doc and 430\doc folders. Supplements to the documents (that is, the latest information) are available in HTML format in the same directories. A IAR specific Wiki Page is also available.

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Design Considerations for In-Circuit Programming

This chapter presents signal requirements for in-circuit programming of the MSP430.

Topic **Page**

2.1 Signal Connections for In-System Programming and Debugging 21
2.2 External Power 25
2.3 Bootstrap Loader (BSL) 25

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2.1 Signal Connections for In-System Programming and Debugging

MSP-FET430PIF, MSP-FET430UIF, MSP-GANG, MSP-GANG430, MSP-PRGS430

With the proper connections, the debugger and an FET hardware JTAG interface (such as the MSP-FET430PIF and MSP-FET430UIF) can be used to program and debug code on the target board. In addition, the connections also support the MSP-GANG430 or MSP-PRGS430 production programmers, thus providing an easy way to program prototype boards, if desired.

Figure 2-1 shows the connections between the 14-pin FET interface module connector and the target device required to support in-system programming and debugging for 4-wire JTAG communication. Figure 2-2 shows the connections for 2-wire JTAG mode (Spy-Bi-Wire). The 4-wire JTAG mode is supported on most MSP430 devices except of small pin count devices e.g. MSP430G2230. The 2-wire JTAG mode is available on selected devices only. See the *CCS User's Guide for MSP430* (SLAU157) or *IAR for MSP430 User's Guide* (SLAU138) for information on which interface method can be used on which device.

The connections for the FET interface module and the MSP-GANG, MSP-GANG430 or MSP-PRGS430 are identical. Both the FET interface module and MSP-GANG430 can supply V_{CC} to the target board (via pin 2). In addition, the FET interface module, MSP-GANG and MSP-GANG430 have a V_{CC}-sense feature that, if used, requires an alternate connection (pin 4 instead of pin 2). The V_{CC}-sense feature senses the local V_{CC} present on the target board (that is, a battery or other local power supply) and adjusts the output signals accordingly. If the target board is to be powered by a local V_{CC}, then the connection to pin 4 on the JTAG should be made, and not the connection to pin 2. This utilizes the V_{CC}-sense feature and prevents any contention that might occur if the local on-board V_{CC} were connected to the V_{CC} supplied from the FET interface module, MSP-GANG or the MSP-GANG430. If the V_{CC}-sense feature is not necessary (that is, if the target board is to be powered from the FET interface module, MSP-GANG or MSP-GANG430), the V_{CC} connection is made to pin 2 on the JTAG header and no connection is made to pin 4. Figure 2-1 and Figure 2-2 show a jumper block that supports both scenarios of supplying V_{CC} to the target board. If this flexibility is not required, the desired V_{CC} connections may be hard-wired eliminating the jumper block. Pins 2 and 4 must not be connected simultaneously.

Note that in 4-wire JTAG communication mode (see Figure 2-1), the connection of the target RST signal to the JTAG connector is optional when using devices that support only 4-wire JTAG communication mode. However, when using devices that support 2-wire JTAG communication mode in 4-wire JTAG mode, the RST connection must be made. The MSP430 development tools and device programmers perform a target reset by issuing a JTAG command to gain control over the device. However, if this is unsuccessful, the RST signal of the JTAG connector may be used by the development tool or device programmer as an additional way to assert a device reset.

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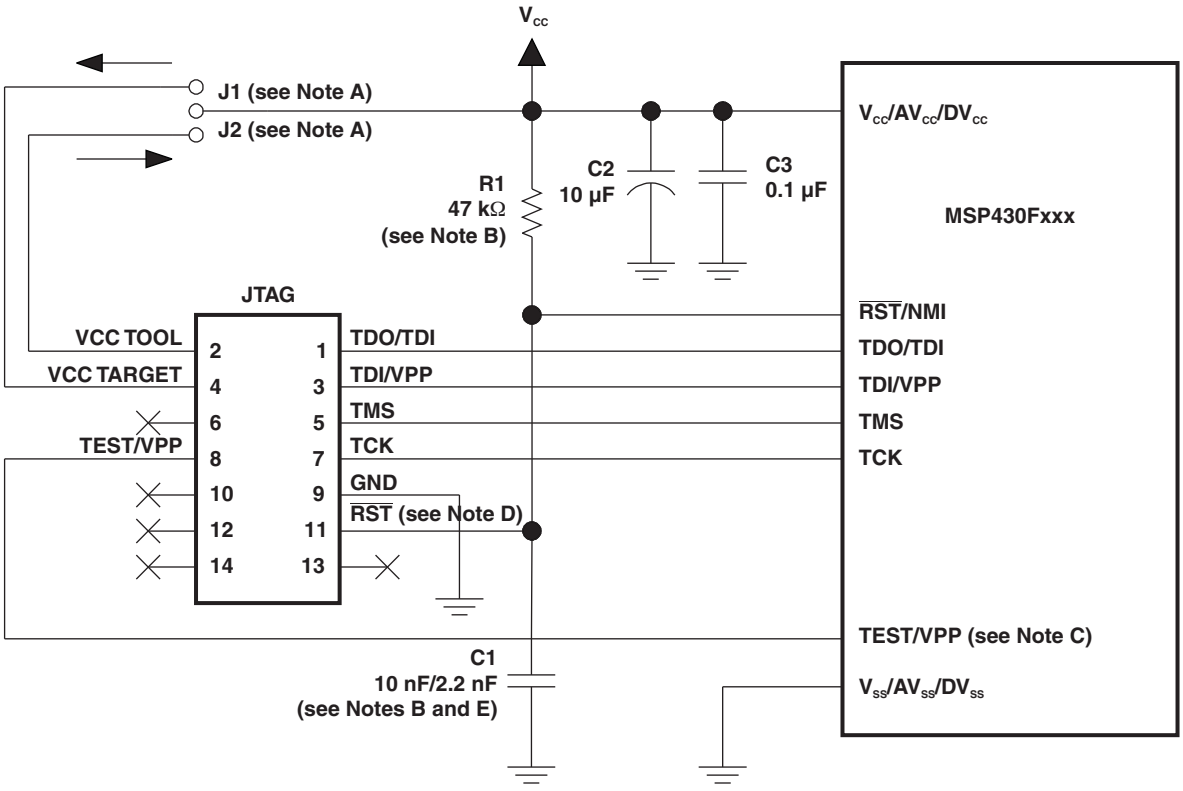

A If a local target power supply is used, make connection J1. If power from the debug or programming adapter is used, make connection J2.

B The configuration of R1 and C1 for the $\overline{\text{RST}}$/NMI pin depends on the device family. See the respective MSP430 family user's guide for the recommended configuration.

C The TEST pin is available only on MSP430 family members with multiplexed JTAG pins. See the device-specific data sheet to determine if this pin is available.

D The connection to the JTAG connector $\overline{\text{RST}}$ pin is optional when using 4-wire JTAG communication mode capable-only devices and not required for device programming or debugging. However, this connection is required when using 2-wire JTAG communication mode capable devices in 4-wire JTAG mode.

E When using 2-wire JTAG communication capable devices in 4-wire JTAG mode, the upper limit for C1 should not exceed 2.2 nF. This applies to both TI FET interface modules (LPT and USB FET).

Figure 2-1. Signal Connections for 4-Wire JTAG Communication

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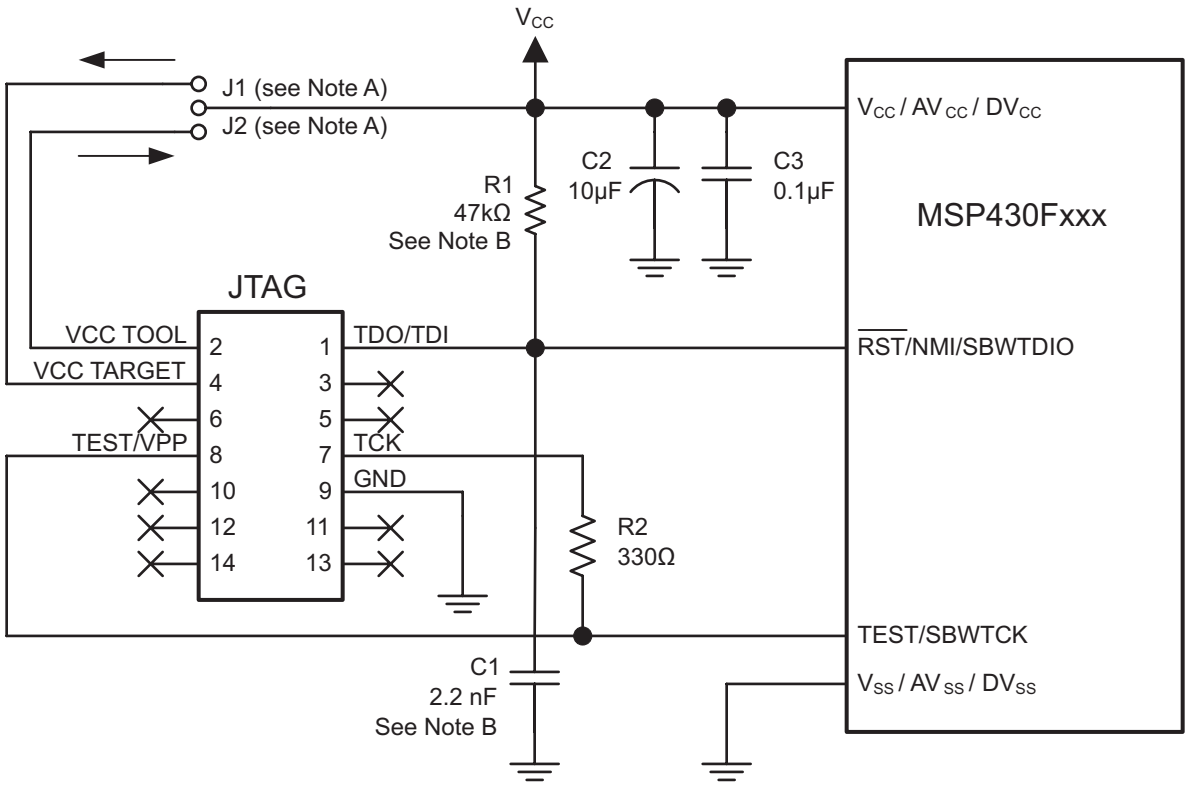

A If a local target power supply is used, make connection J1. If power from the debug or programming adapter is used, make connection J2.

B The device $\overline{\text{RST}}$/NMI/SBWTDIO pin is used in 2-wire mode for bidirectional communication with the device during JTAG access, and any capacitance that is attached to this signal may affect the ability to establish a connection with the device. The upper limit for C1 is 2.2 nF when using current TI tools.

C R2 protects the JTAG debug interface TCK signal from the JTAG security fuse blow voltage that is supplied by the TEST/VPP pin during the fuse blow process. If fuse blow functionality is not needed, R2 is not required (populate 0 Ω) and do not connect TEST/VPP to TEST/SBWTCK.

Figure 2-2. Signal Connections for 2-Wire JTAG Communication (Spy-Bi-Wire) Used by MSP430F2xx, MSP430G2xx and MSP430F4xx Devices

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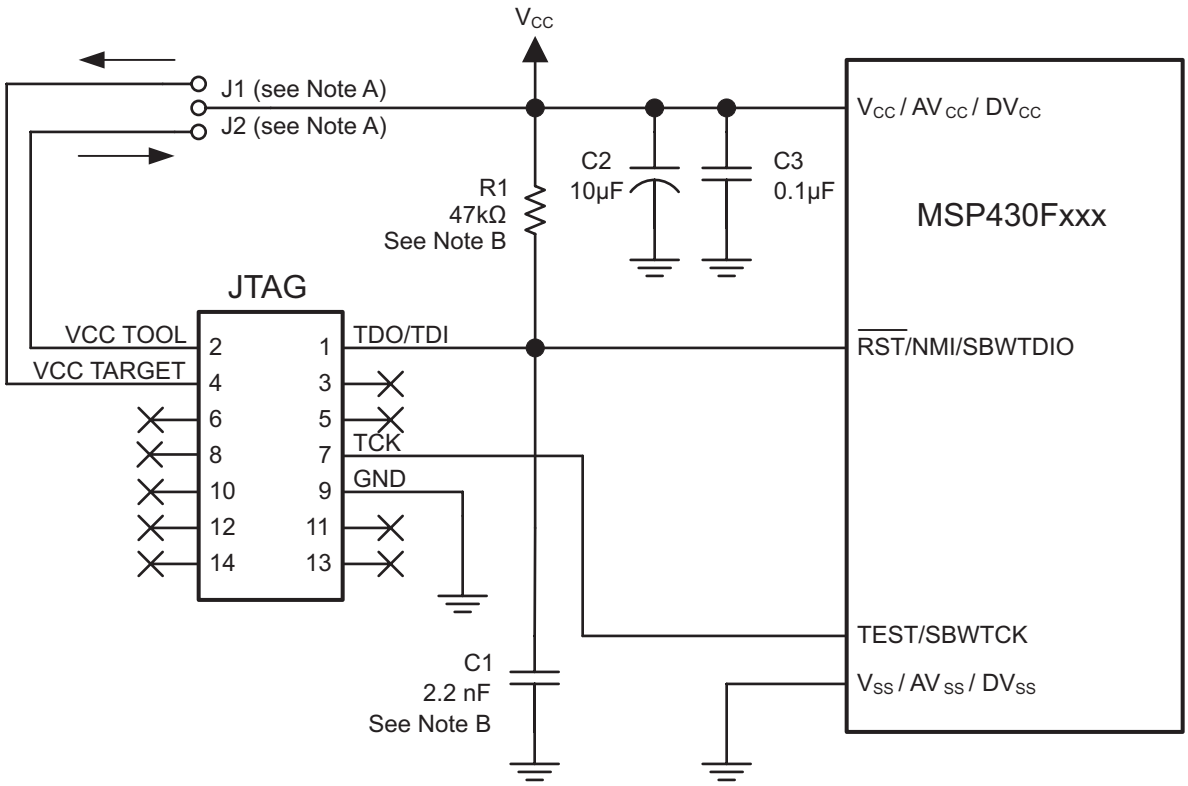

A Make connection J1 if a local target power supply is used, or make connection J2 if the target is powered from the debug or programming adapter.

B The device $\overline{\text{RST}}$/NMI/SBWTDIO pin is used in 2-wire mode for bidirectional communication with the device during JTAG access, and any capacitance that is attached to this signal may affect the ability to establish a connection with the device. The upper limit for C1 is 2.2 nF when using current TI tools.

Figure 2-3. Signal Connections for 2-Wire JTAG Communication (Spy-Bi-Wire) Used by MSP430F5xx and MSP430F6xx Devices

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2.2 External Power

The MSP-FET430UIF can supply targets with up to 60 mA through pin 2 of the 14-pin connector. Please note that the target should not consume more than 60 mA, even as a peak current, as it may violate the USB specification. E.g., if the target board has a capacitor on VCC more than 10 µF, it may cause inrush current during capacitor charging that may exceed 60 mA. In this case the current should be limited by the design of the target board, or an external power supply should be used.

The V_{CC} for the target can be selected between 1.8 V and 3.6 V in steps of 0.1 V. Alternatively, the target can be supplied externally. In this case, the external voltage should be connected to pin 4 of the 14-pin connector. The MSP-FET430UIF then adjusts the level of the JTAG signals to external V_{CC} automatically. Only pin 2 (MSP-FET430UIF supplies target) or pin 4 (target is externally supplied) must be connected; not both at the same time.

When a target socket module is powered from an external supply, the external supply powers the device on the target socket module and any user circuitry connected to the target socket module, and the FET interface module continues to be powered from the PC via the parallel port. If the externally supplied voltage differs from that of the FET interface module, the target socket module must be modified so that the externally supplied voltage is routed to the FET interface module (so that it may adjust its output voltage levels accordingly). See the target socket module schematics in Appendix B.

The PC parallel port can source a limited amount of current. Because of the ultralow-power requirement of the MSP430, a standalone FET does not exceed the available current. However, if additional circuitry is added to the tool, this current limit could be exceeded. In this case, external power can be supplied to the tool via connections provided on the target socket modules. See the schematics and pictorials of the target socket modules in Appendix B to locate the external power connectors. Note that the MSP-FET430PIF is not recommended for new design.

2.3 Bootstrap Loader (BSL)

The JTAG pins provide access to the flash memory of the MSP430Fxxx devices. On some devices, these pins are shared with the device port pins, and this sharing of pins can complicate a design (or sharing may not be possible). As an alternative to using the JTAG pins, most MSP430Fxxx devices contain a program (a "bootstrap loader") that permits the flash memory to be erased and programmed using a reduced set of signals. The *MSP430 Programming Via the Bootstrap Loader User's Guide* (SLAU319) describes this interface. See the MSP430 web site for the application reports and a list of MSP430 BSL tool developers.

TI suggests that MSP430Fxxx customers design their circuits with the BSL in mind (that is, TI suggests providing access to these signals by, for example, a header).

See FAQ Hardware #10 for a second alternative to sharing the JTAG and port pins.

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Frequently Asked Questions and Known Issues

This appendix presents solutions to frequently asked questions regarding the MSP-FET430 hardware.

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A.1 Hardware FAQs

1. **MSP430F22xx Target Socket Module (MSP-TS430DA38) – Important Information**
   Due to the large capacitive coupling introduced by the device socket between the adjacent signals XIN/P2.6 (socket pin 6) and $\overline{\text{RST}}$/SBWTDIO (socket pin 7), in-system debugging can disturb the LFXT1 low-frequency crystal oscillator operation (ACLK). This behavior applies only to the Spy-Bi-Wire (2-wire) JTAG configuration and only to the period while a debug session is active.
   Workarounds:
   - Use the 4-wire JTAG mode debug configuration instead of the Spy-Bi-Wire (2-wire) JTAG configuration. This can be achieved by placing jumpers JP4 through JP9 accordingly.
   - Use the debugger option "Run Free" that can be selected from the Advanced Run drop-down menu (at top of Debug View). This prevents the debugger from accessing the MSP430 while the application is running. Note that, in this mode, a manual halt is required to see if a breakpoint was hit. See the IDE documentation for more information on this feature.
   - Use an external clock source to drive XIN directly.
2. **With current interface hardware and software, there is a weakness when adapting target boards that are powered externally**. This leads to an accidental fuse check in the MSP430. This is valid for PIF and UIF but is mainly seen on UIF. A solution is being developed.
   Workarounds:
   - Connect $\overline{\text{RST}}$/NMI pin to JTAG header (pin 11), LPT and USB tools are able to pull the RST line, which also resets the device internal fuse logic.
   - Use the debugger option "Release JTAG On Go" that can be selected from the IDE drop-down menu. This prevents the debugger from accessing the MSP430 while the application is running. Note that in this mode, a manual halt is required to see if a breakpoint was hit. See the IDE documentation for more information on this feature.
   - Use an external clock source to drive XIN directly.
3. The 14-conductor **cable** connecting the FET interface module and the target socket module **must not exceed 8 inches (20 centimeters) in length**.
4. The signal assignment on the **14-conductor cable** is **identical** for the **parallel port interface** and the **USB FET**.
5. **To utilize the on-chip ADC voltage references, the capacitor must be installed** on the target socket module. See schematic of the target socket module to populate the capacitor according to the data sheet of the device.
6. **To utilize the charge pump on the devices with LCD+ Module, the capacitor must be installed** on the target socket module. See schematic of the target socket module to populate the capacitor according to the data sheet of the device.
7. **Crystals or resonators Q1 and Q2** (if applicable) **are not provided on the target socket module.** For MSP430 devices that contain user-selectable loading capacitors, see device and crystal data sheets for the value of capacitance.
8. **Crystals or resonators have no effect upon the operation of the tool and the CCS debugger or C-SPY** (as any required clocking and timing is derived from the internal DCO and FLL).
9. **On devices with multiplexed port or JTAG pins**, to use these pin in their port capability:
   For CCS: "Run Free" (in Run pulldown menu at top of Debug View) must be selected.
   For C-SPY: "Release JTAG On Go" must be selected.
10. **As an alternative to sharing the JTAG and port pins** (on low pin count devices), **consider using an MSP430 device that is a "superset" of the smaller device.** A very powerful feature of the MSP430 is that the family members are code and architecturally compatible, so code developed on one device (for example, one without shared JTAG and port pins) ports effortlessly to another (assuming an equivalent set of peripherals).

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11. **Information memory may not be blank** (erased to 0xFF) when the device is delivered from TI. Customers should erase the information memory before its first use. Main memory of packaged devices is blank when the device is delivered from TI.
12. **The device current is higher then expected.** The device current measurement may not be accurate with the debugger connected to the device. For accurate measurement, disconnect the debugger.
13. The following **ZIF sockets** are used in the FET tools and target socket modules:
    - 8-pin device (D package): Yamaichi IC369-0082
    - 14-pin device (PW package): Enplas OTS-14-065-01
    - 14-pin package for 'L092 (PW package): Yamaichi IC189-0142-146
    - 24-pin package (PW package): Enplas OTS-24(28)-0.65-02
    - 28-pin device (DW package): Wells-CTI 652 D028
    - 28-pin device (PW package): Enplas OTS-28-0.65-01
    - 38-pin device (DA package): Yamaichi IC189-0382-037
    - 40-pin device (RHA package): Enplas QFN-40B-0.5-01
    - 40-pin device (RSB package): Enplas QFN-40B-0.4
    - 48-pin device (RGZ package): Yamaichi QFN11T048-008 A101121-001
    - 48-pin device (DL package): Yamaichi IC51-0482-1163
    - 64-pin device (PM package): Yamaichi IC51-0644-807
    - 64-pin device (RGC package): Yamaichi QFN11T064-006
    - 80-pin device (PN package): Yamaichi IC201-0804-014
    - 100-pin device (PZ package): Yamaichi IC201-1004-008
    - 128-pin device (PEU package): Yamaichi IC500-1284-009P

    Enplas: www.enplas.com

    Wells-CTI: www.wellscti.com

    Yamaichi: www.yamaichi.us

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A.2 Known Issues

MSP-FET430UIF *Current detection algorithm of the UIF firmware*

Problem Description

If high current is detected, the I_{CC} monitor algorithm stays in a loop of frequently switching on and off the target power supply. This power switching puts some MSP430 devices such as the MSP430F5438 in a state that requires a power cycle to return the device to JTAG control.

A side issue is that if the UIF firmware has entered this switch on and switch off loop, it is not possible to turn off the power supply to the target by calling MSP430_VCC(0). A power cycle is required to remove the device from this state.

Solution

IAR KickStart and Code Composer Essentials that have the MSP430.dll version 2.04.00.003 and higher do not show this problem. Update the software development tool to this version or higher to update the MSP-FET430UIF firmware.

MSP-FET430PIF *Some PCs do not supply 5 V through the parallel port*

Problem Description

Device identification problems with modern PCs, because the parallel port often does not deliver 5 V as was common with earlier hardware.

1. When connected to a laptop, the test signal is clamped to 2.5 V.
2. When the external V_{CC} becomes less than 3 V, up to 10 mA is flowing in the adapter via pin 4 (sense).

Solution

Measure the voltage level of the parallel port. If it is too low, provide external 5 V to the V_{CC} pads of the interface. The jumper on a the target socket must be switched to external power.

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Hardware

This appendix contains information relating to the FET hardware, including schematics, PCB pictorials, and bills of materials. All other tools, such as the eZ430 series, are described in separate product-specific user's guides.

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B.1 MSP-TS430D8

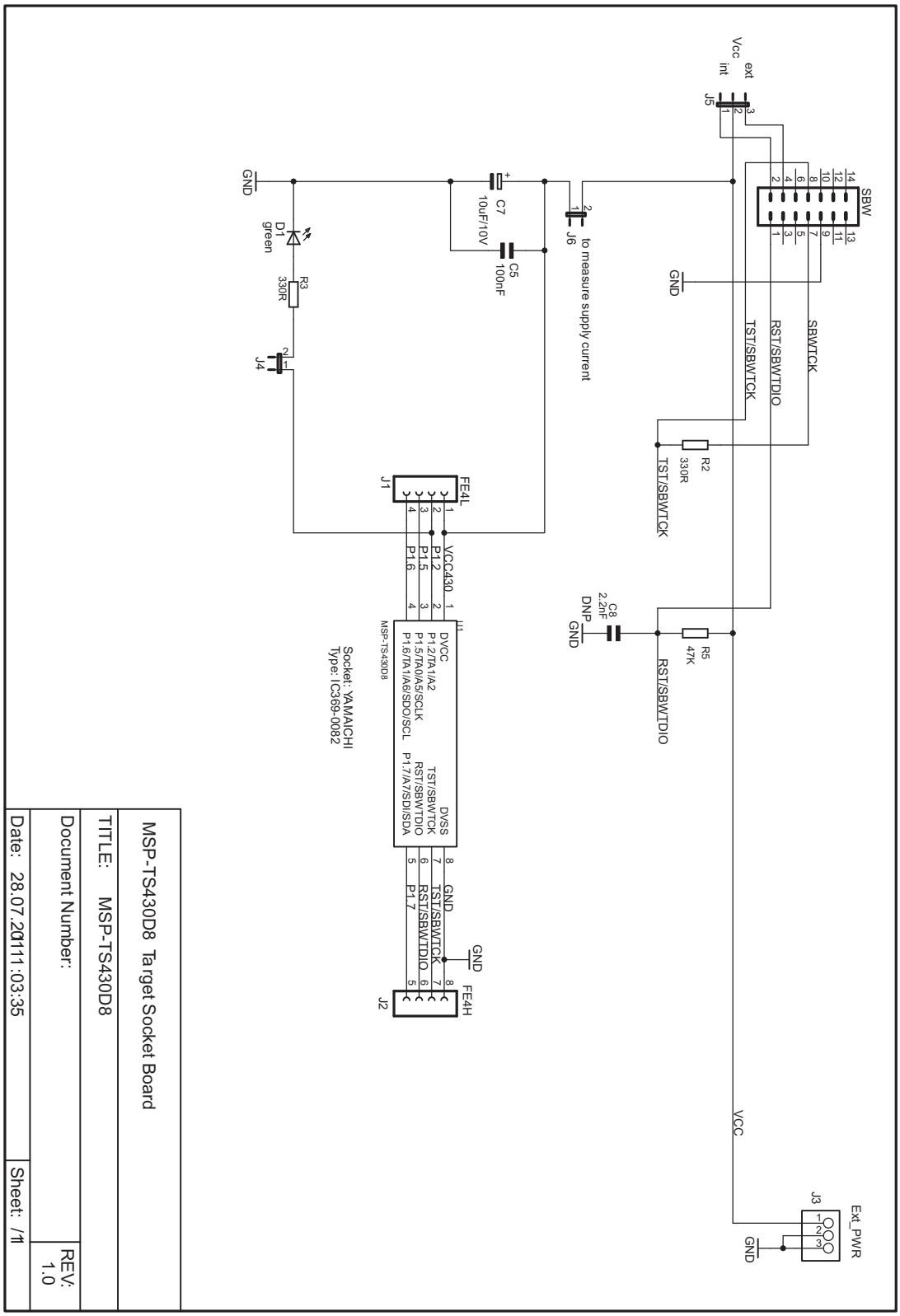

Figure B-1. MSP-TS430D8 Target Socket Module, Schematic

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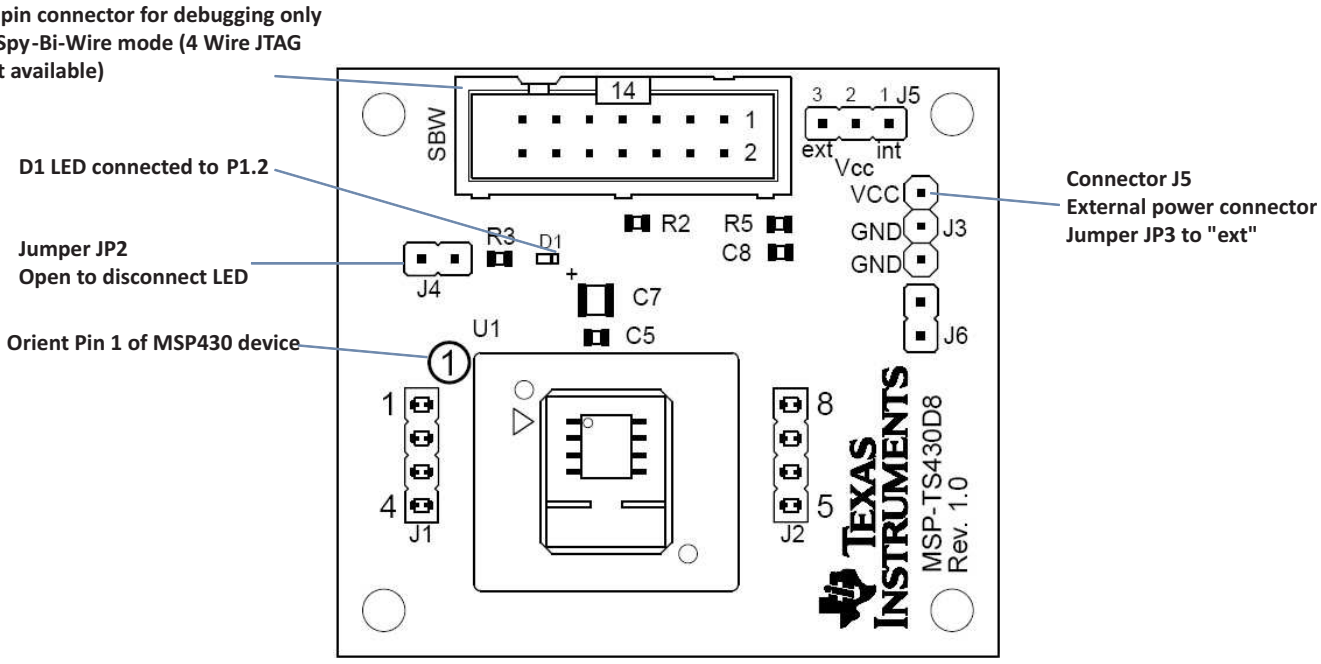

Figure B-2. MSP-TS430D8 Target Socket Module, PCB

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Table B-1. MSP-TS430D8 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	J4, J6	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
2	J5	1	3-pin header, male, TH	SAM1035-03-ND	place jumper on pins 1-2
3	SBW	1	10-pin connector, male, TH	HRP10H-ND	
4	J3	1	3-pin header, male, TH	SAM1035-03-ND	
5	C8	1	2.2nF, CSMD0805	Buerklin 53 D 292	
6	C7	1	10uF, 10V, 1210ELKO	478-3875-1-ND	
7	R5	1	47K, 0805	541-47000ATR-ND	
8	C5	1	100nF, CSMD0805	311-1245-2-ND	
9	R2, R3	2	330R, 0805	541-330ATR-ND	
10	J1, J2	2	4-pin header, TH	SAM1029-04-ND	DNP: headers enclosed with kit. Keep vias free of solder.
10,1	J1, J2	1	4-pin socket, TH	SAM1029-04-ND	DNP: receptacles enclosed with kit.
11	U1	1	SO8 Socket: Type IC369-0082		Manuf.: Yamaichi
12	D1	1	red, LED 0603		
13	MSP430	2	MSP430x		"DNP: enclosed with kit. Is supplied by TI"
14	PCB	1	50,0mmx44,5mm	MSP-TS430D8 Rev. 1.0	

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B.2 MSP-TS430PW14

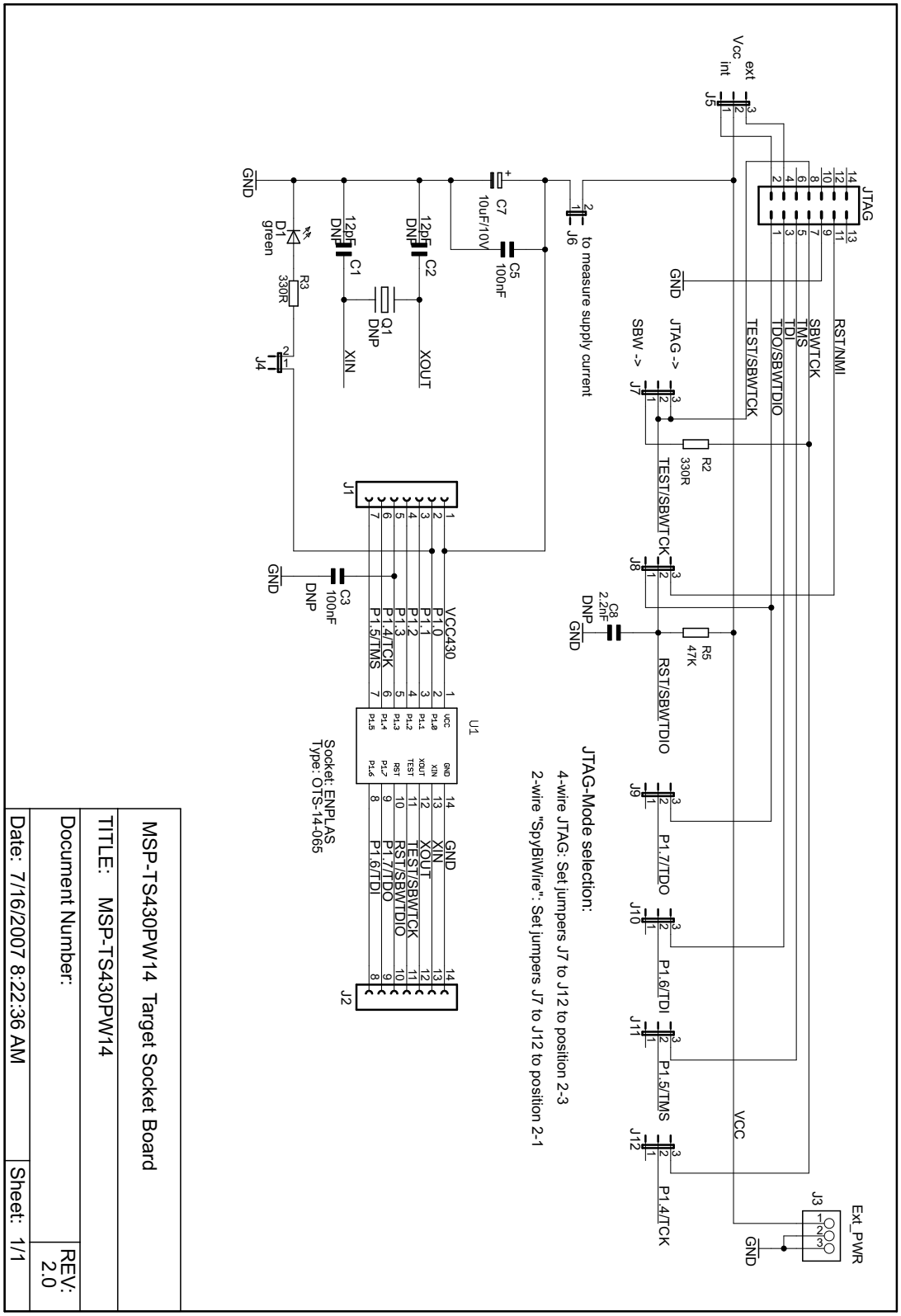

Figure B-3. MSP-TS430PW14 Target Socket Module, Schematic

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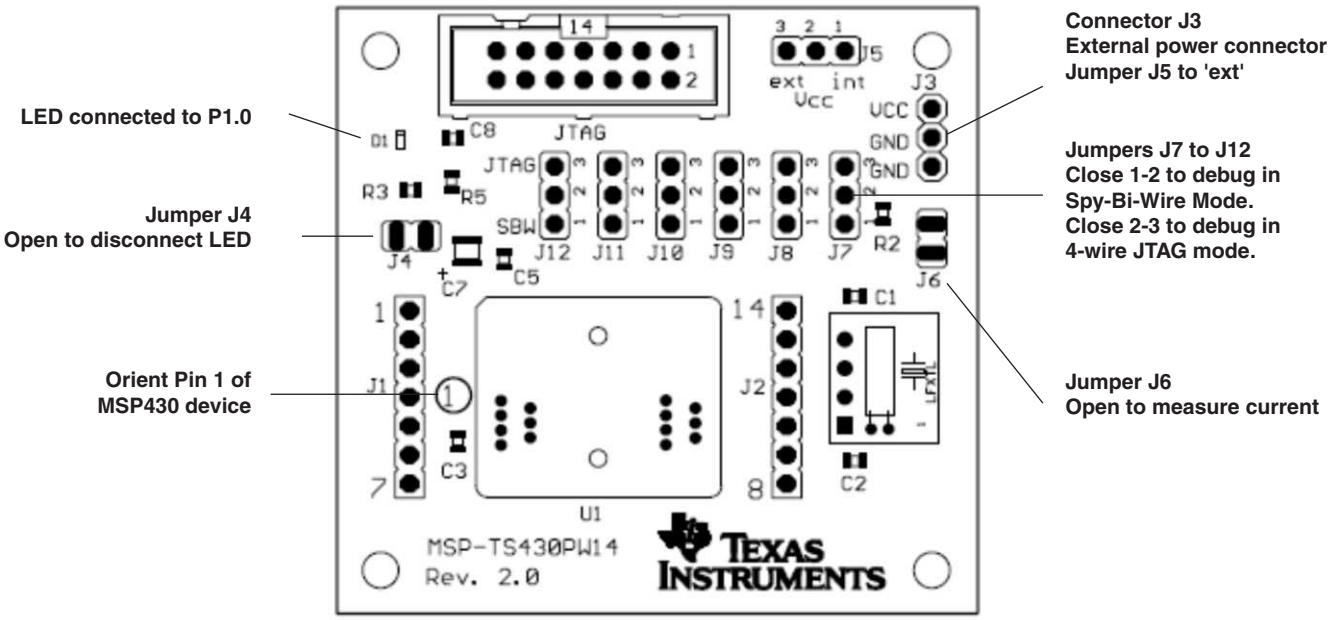

Figure B-4. MSP-TS430PW14 Target Socket Module, PCB

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Table B-2. MSP-TS430PW14 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C7	1	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C3, C5	1	100nF, SMD0805	478-3351-2-ND	DNP: C3
4	C8	0	2.2nF, SMD0805		DNP
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2	0	7-pin header, TH	SAM1029-07-ND SAM1213-07-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder : Header : Receptacle
7	J3, J5, J7, J8, J9, J10, J11, J12	8	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on headers J5, J7, J8, J9, J10, J11, J12; Pos 1-2
8	J4, J6	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	Place on: J5, J7-J12; Pos 1-2
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: keep vias free of solder
13	R2, R3	2	330 Ω, SMD0805	541-330ATR-ND	
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: OTS-14-0.65-01		Manuf.: Enplas
17	PCB	1	56 x 53 mm		2 layers
18	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	For example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F2013IPW		DNP: enclosed with kit, supplied by TI

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B.3 MSP-TS430L092

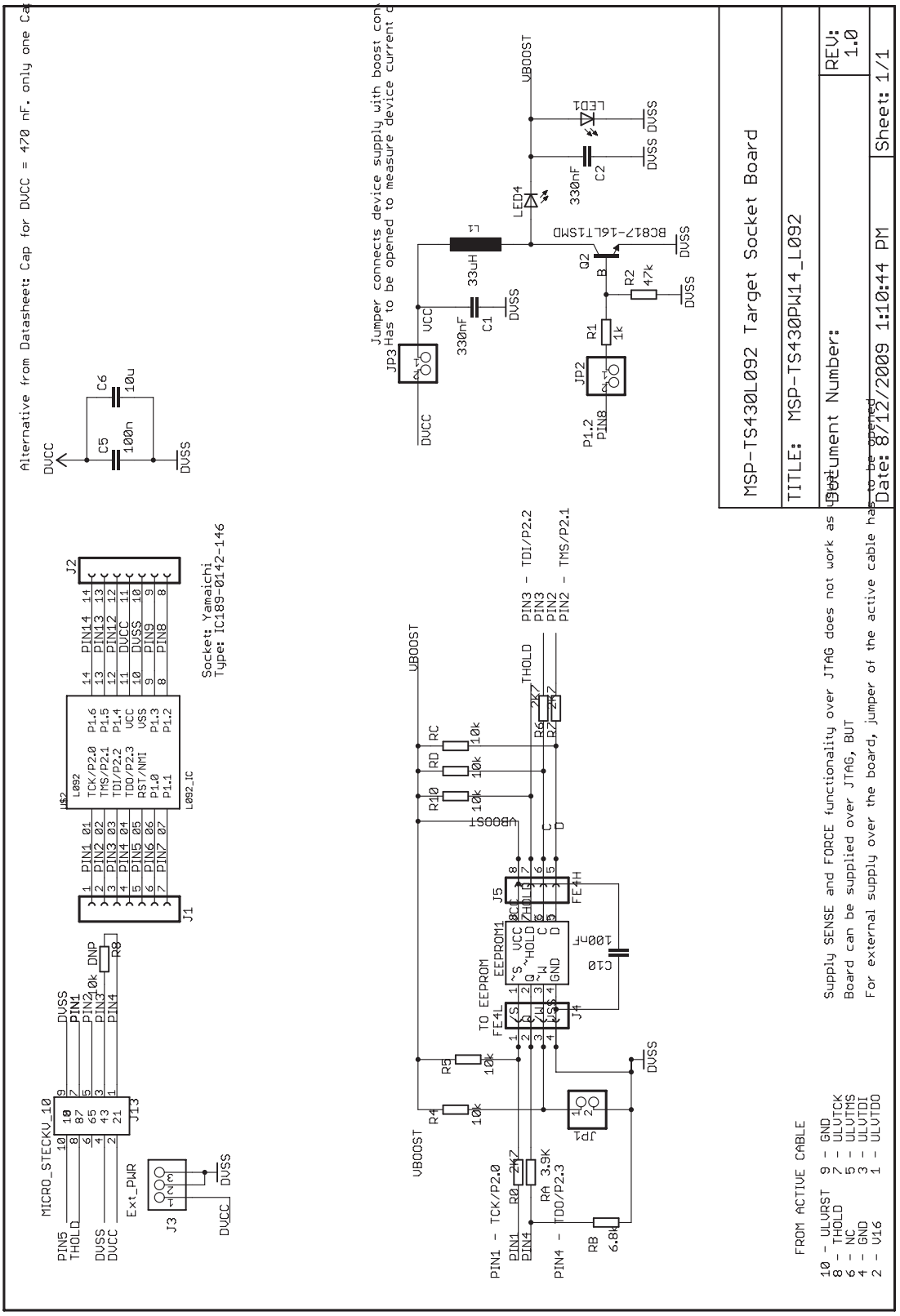

Figure B-5. MSP-TS430L092 Target Socket Module, Schematic

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Settings of the MSP-TS430L092 Target Socket

Figure B-6 shows the PCB layout of the MSP-TS430L092 target socket. The following pinning is recommended:

- JP1 is write enable for the EPROM. If this is not set, the EPROM can only be read.
- JP2 and JP3 connect device supply with boost converter. They can be opened to measure device current consumption. For default operation, they should be closed.

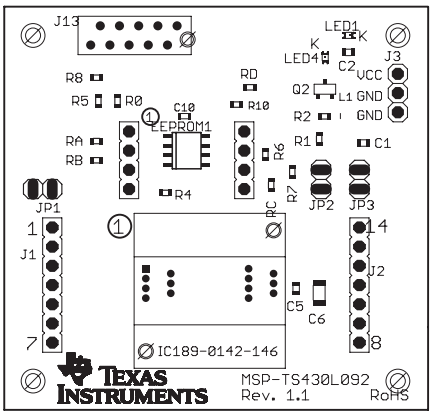

Figure B-6. MSP-TS430L092 Target Socket Module, PCB

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Table B-3. MSP-TS430L092 Bill of Materials

Pos.	Ref Des No.	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	2	330nF, SMD0603		
2	C5	1	100n, SMD0603		
3	C6	1	10u, SMD0805		
4	C10	1	100n, SMD0603		
5	EEPROM1	1	M95512 SO08 (SO8)	ST Micro M95160R	Digikey: 497-8688-1-ND
7	J1, J2	2	7-pin header, TH	SAM1213-07-ND SAM1035-07-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J3	1	3-pin header, male, TH	SAM1035-03-ND	
9	J4, J5	2	FE4L, FE4H	4 pol. Stiftreihe	DNP; Keep vias free of solder.
11	J13	1	MICRO_STECKV_10		Reichelt: MicroMaTch-Connector: MM FL 10G
12	JP1, JP2,JP3	3	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
15	L1	1	33uH, SMD0806	LQH2MCN330K02L	Farnell: 151-5557
16	LED1, LED4	2	LEDCHIPLED_0603		Farnell: 1686065
17	Q2	1	BC817-16LT1SMD	BC817-16LT1SMD	SOT23-BEC
18	R0, R6, R7	3	2K7, SMD0603		
19	R1	1	1k, SMD0603		
20	R2	1	47k, SMD0603		
21	R4,R5, R8, R10, RC, RD	6	10k, SMD0603		
22	RA	1	3.9k, SMD0603		
23	RB	1	6.8k, SMD0603		
24	U1	1	14 Pin Socket - IC189-0142-146	Manuf. Yamaichi	
22	MSP430	2	MSP430L092PWR	DNP: Enclosed with kit. Is supplied by TI.	

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B.4 MSP-TS430L092 Active Cable

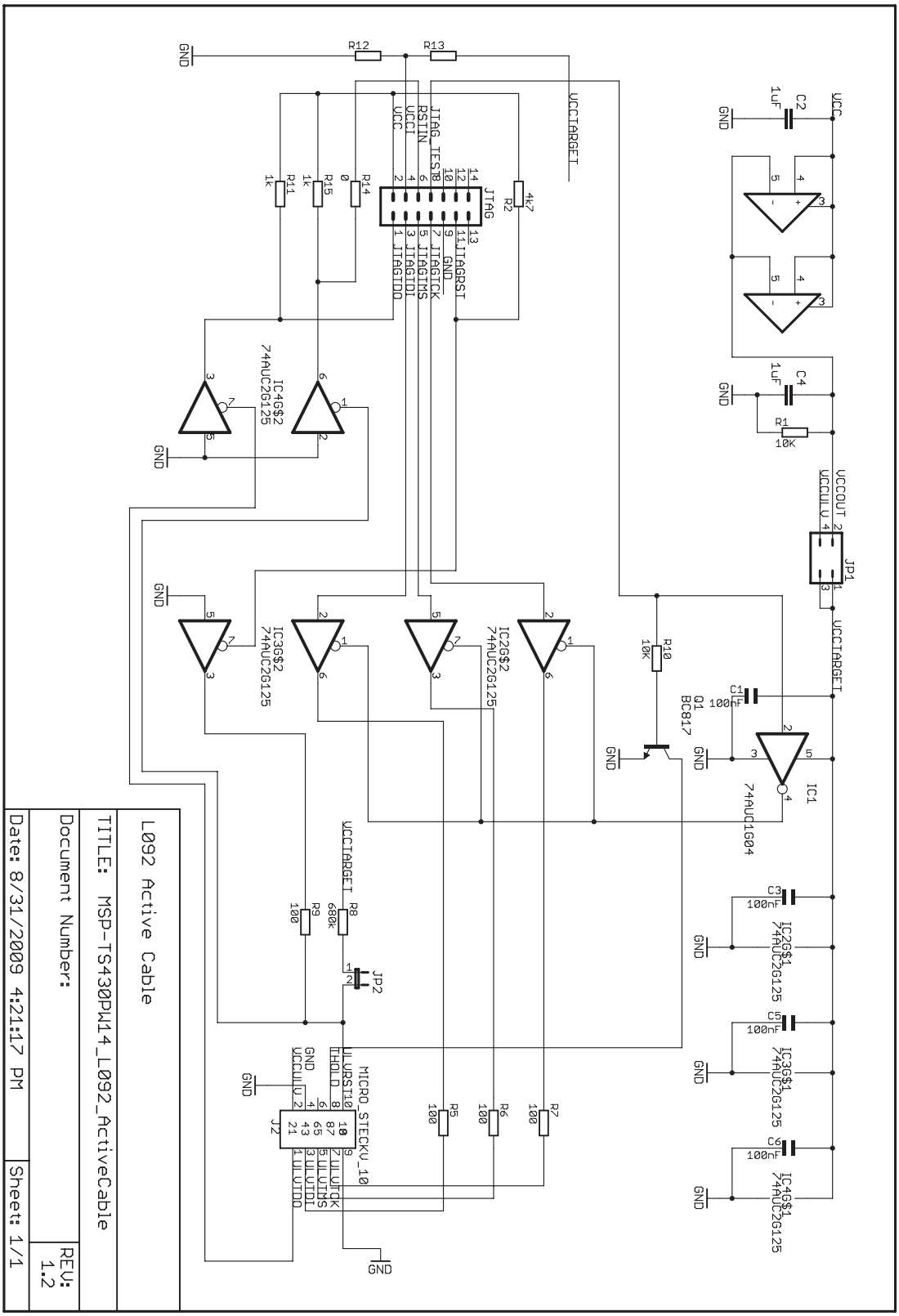

Figure B-7. MSP-TS430L092 Active Cable Target Socket Module, Schematic

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Figure B-8 shows the PCB layout for the Active Cable. The following pinning is possible:

- JP1 has two jumpers (Jumper 1 and Jumper 2) that can be set as shown in Table B-4.

Table B-4. MSP-TS430L092 JP1 Settings

Jumper 1	Jumper 2	Description
Off	Off	The active cable has no power and does not function.
Off	On	The active cable receives power from target socket. For this option, the target socket must have its own power supply.
On	Off	The active cable receives power from the JTAG connector.
On	On	The JTAG connector powers the active cable and the target socket. For this option, the target socket must not have its own power source, as this would cause a not defined state.

- JP2 is for reset. For the standard MSP-TS430L092, this jumper must be set. It sets the reset pin to high and can also control it. Without this jumper on the MSP-TS430L092, reset is set to zero.

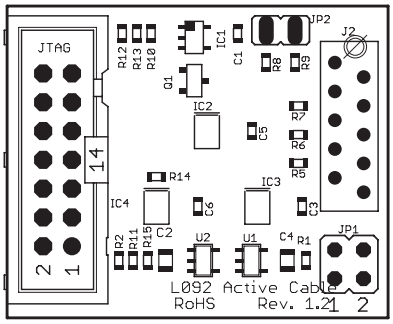

Figure B-8. MSP-TS430L092 Active Cable Target Socket Module, PCB

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Table B-5. MSP-TS430L092 Active Cable Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C3, C5, C6	4	100nF, SMD0603		
2	C2, C4	2	1uF, SMD0805		
3	R1, R10	2	10K, SMD0603		
4	R2	1	4K7, SMD0603		
5	R5, R6, R7, R9	4	100, SMD0603		
6	R8	1	680k, SMD0603		
7	R11, R15	2	1K, SMD0603		
8	R12	0	SMD0603		DNP
9	R13	0	SMD0603		DNP
10	R14	1	0, SMD0603		
11	IC1	1	SN74AUC1G04DBVR		Manu: TI
12	IC2, IC3, IC4	3	SN74AUC2G125DCTR		Manu: TI
13	J2	1	MICRO_STECKV_10	Reichelt: MicroMaTch-Connector: MM FL 10G	
14	JP1	1	2x2 Header	JP2Q	Put jumper on Position 1 and 2. Do not mix direction.
15	JP2	1	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
16	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
17	Q1	1	BC817-25LT1SMD, SOT23-BEC	Digi-Key: BC817-25LT1GOSCT-ND	
18	U1, U2	2	TLVH431IDBVR	SOT23-5	Manu: TI

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B.5 MSP-TS430PW24

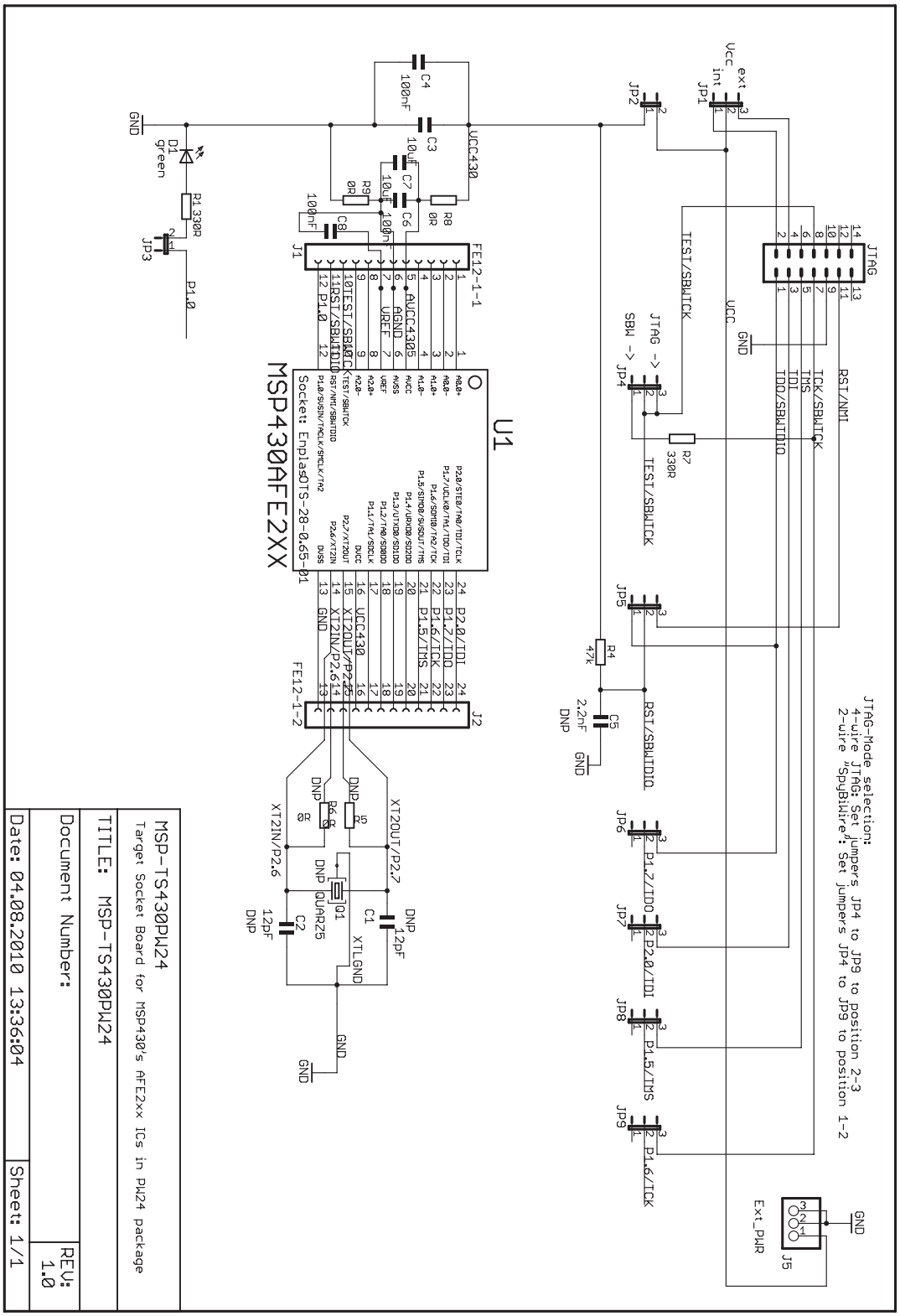

Figure B-9. MSP-TS430PW24 Target Socket Module, Schematic

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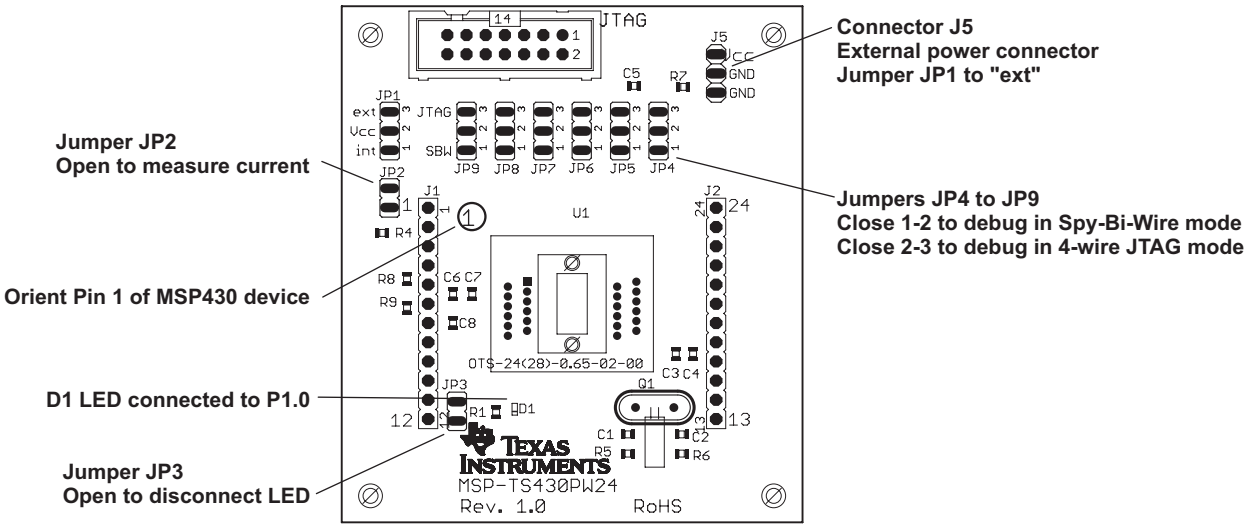

Figure B-10. MSP-TS430PW24 Target Socket Module, PCB

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Table B-6. MSP-TS430PW24 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C5	1	2.2nF, SMD0805		
3	C3, C7	2	10uF, 10V, SMD0805		
4	C4, C6, C8	3	100nF, SMD0805	478-3351-2-ND	
5	D1	1	green LED, SMD0805	P516TR-ND	
6	J1, J2	0	12-pin header, TH	"SAM1029-07-NDSAM1213-07-ND"	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder. (Header & Receptacle)
7	J5, JP1, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	Place jumper on 1-2 of JP4-JP9 Place on 1-2 on JP1
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	see Pos 7 an 8
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	Q1	0	Crystal		DNP: keep vias free of solder
12	R1, R7	2	330 Ω, SMD0805	541-330ATR-ND	
13	R5, R6, R8, R9,	2	0 Ohm, SMD0805	541-000ATR-ND	DNP R5, R6
14	R4	1	47k Ohm, SMD0805	541-47000ATR-ND	
15	U1	1	Socket: OTS 24(28)-065-02-00		Manuf.: Enplas
16	PCB	1	68.5 x 61 mm		2 layers
17	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
18	MSP430	2	MSP430AFE2xx		DNP: enclosed with kit, supplied by TI

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B.6 MSP-TS430DW28

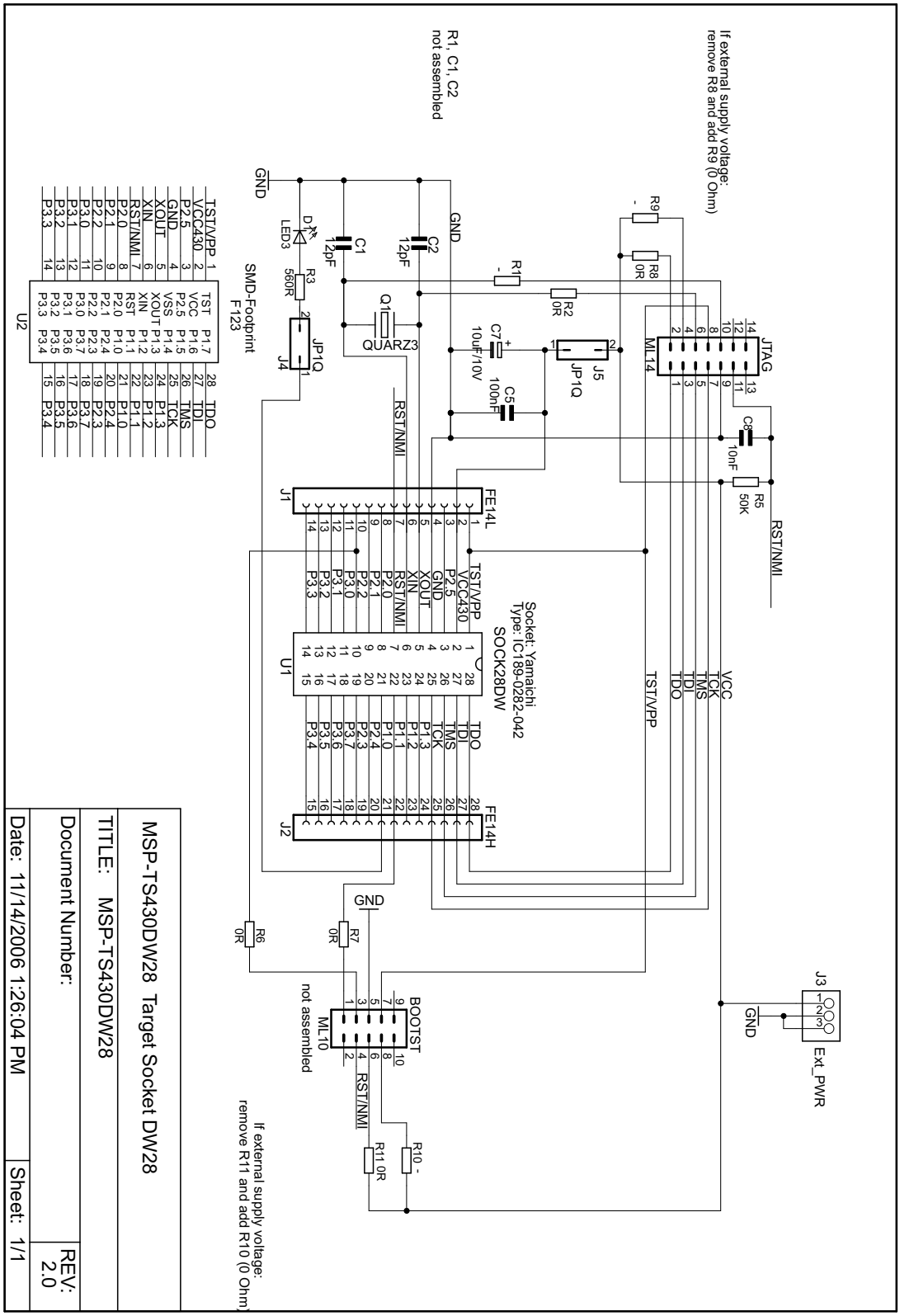

Figure B-11. MSP-TS430DW28 Target Socket Module, Schematic

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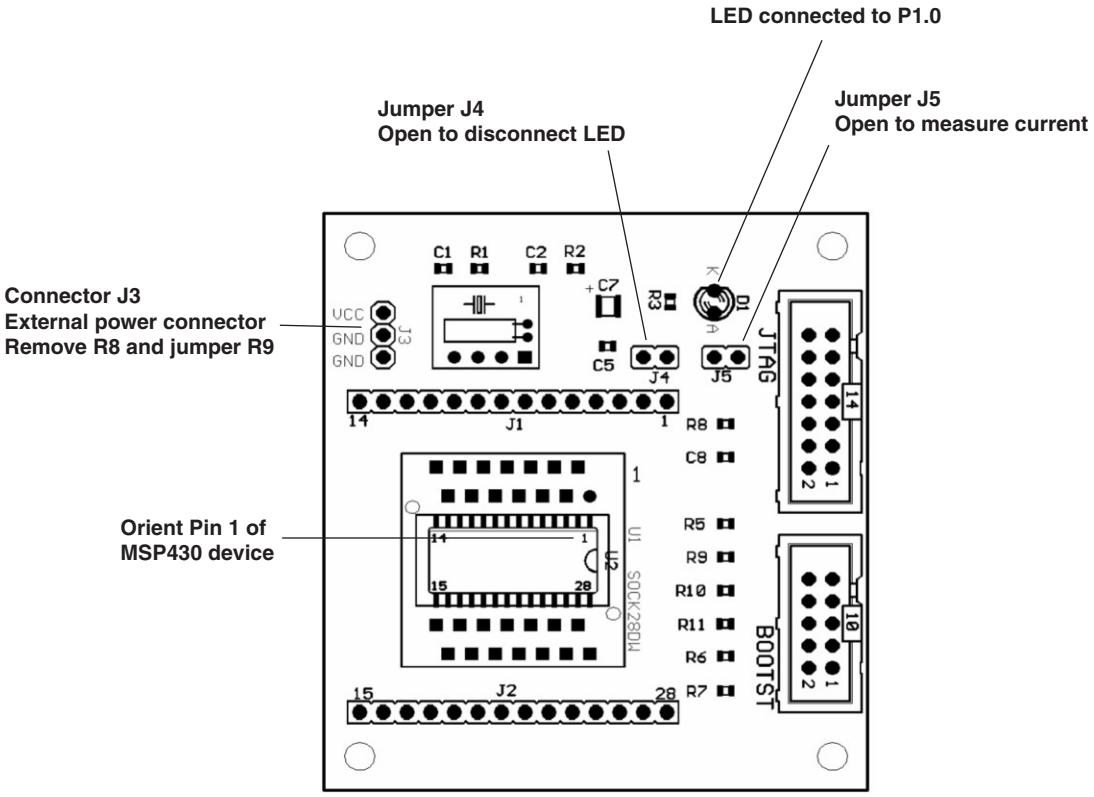

Figure B-12. MSP-TS430DW28 Target Socket Module, PCB

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Table B-7. MSP-TS430DW28 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2, Cover holes while soldering
2	C5	1	100nF, SMD0805		
3	C7	1	10uF, 10V Tantal Elko B		
4	C8	1	10nF	SMD0805	
5	D1	1	LED3 T1 3mm yellow	RS: 228-4991	
6	Q1	0	QUARZ, Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Cover holes while soldering
7	J1, J2	2	14-pin header, TH male		DNP: Headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		2	14-pin header, TH female		DNP: Headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J3	1	3-Pin Connector, male		
9	J4, J5	2	2-Pin Connector, male		With jumper
10	BOOTST	0	ML10, 10-Pin Conn., m	RS: 482-115	DNP, Cover holes while soldering
11	JTAG	1	ML14, 14-Pin Conn., m	RS: 482-121	
12	R1, R2, R6, R7, R8,R9, R10, R11	4	0R, SMD0805		DNP: R1, R2, R9, R10
13	R3	1	560R, SMD0805		
14	R5	1	47K, SMD0805		
15	U1	1	SOP28DW socket	Yamaichi: IC189-0282-042	
16	U2	0	TSSOP		DNP

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B.7 MSP-TS430PW28

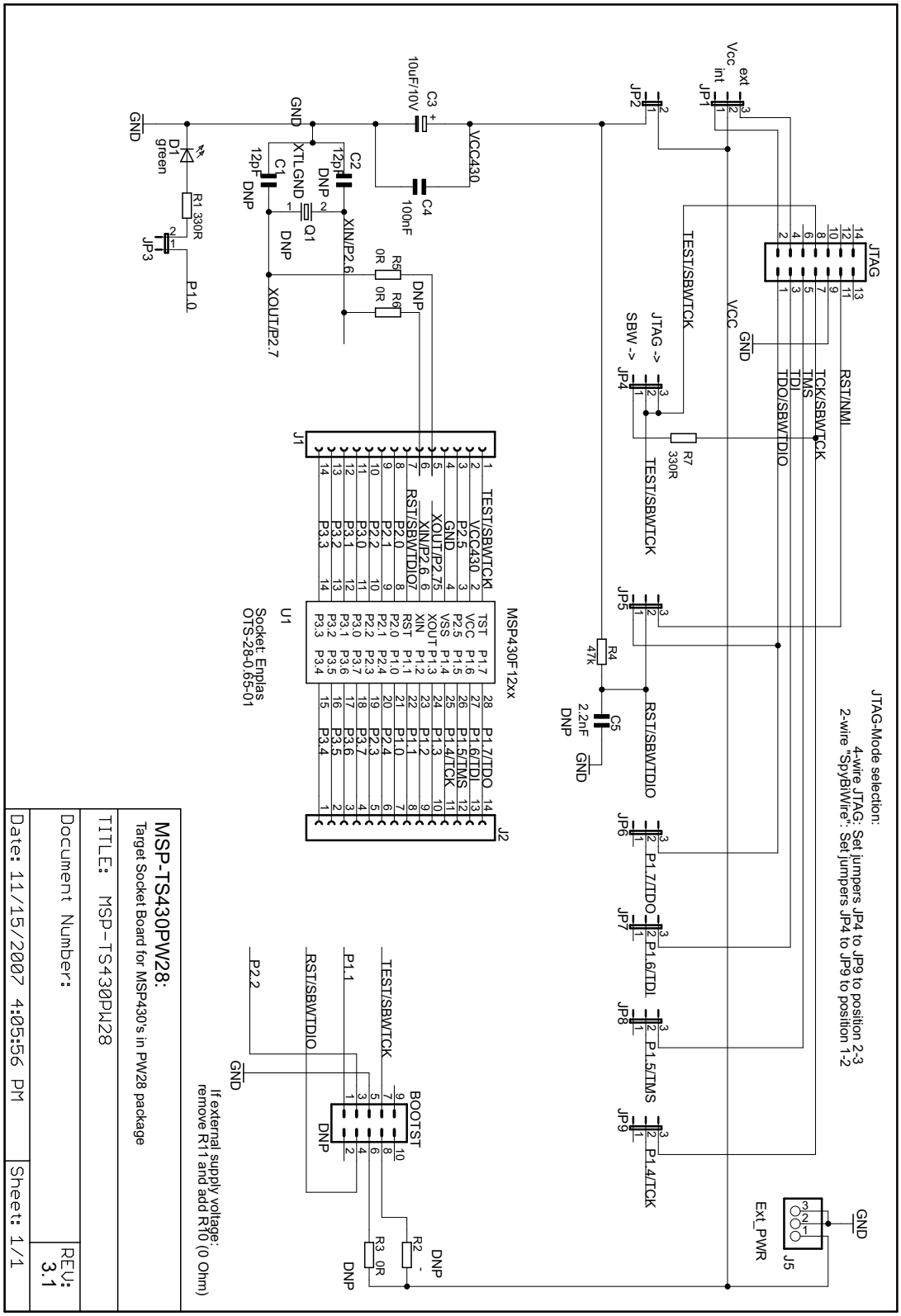

Figure B-13. MSP-TS430PW28 Target Socket Module, Schematic

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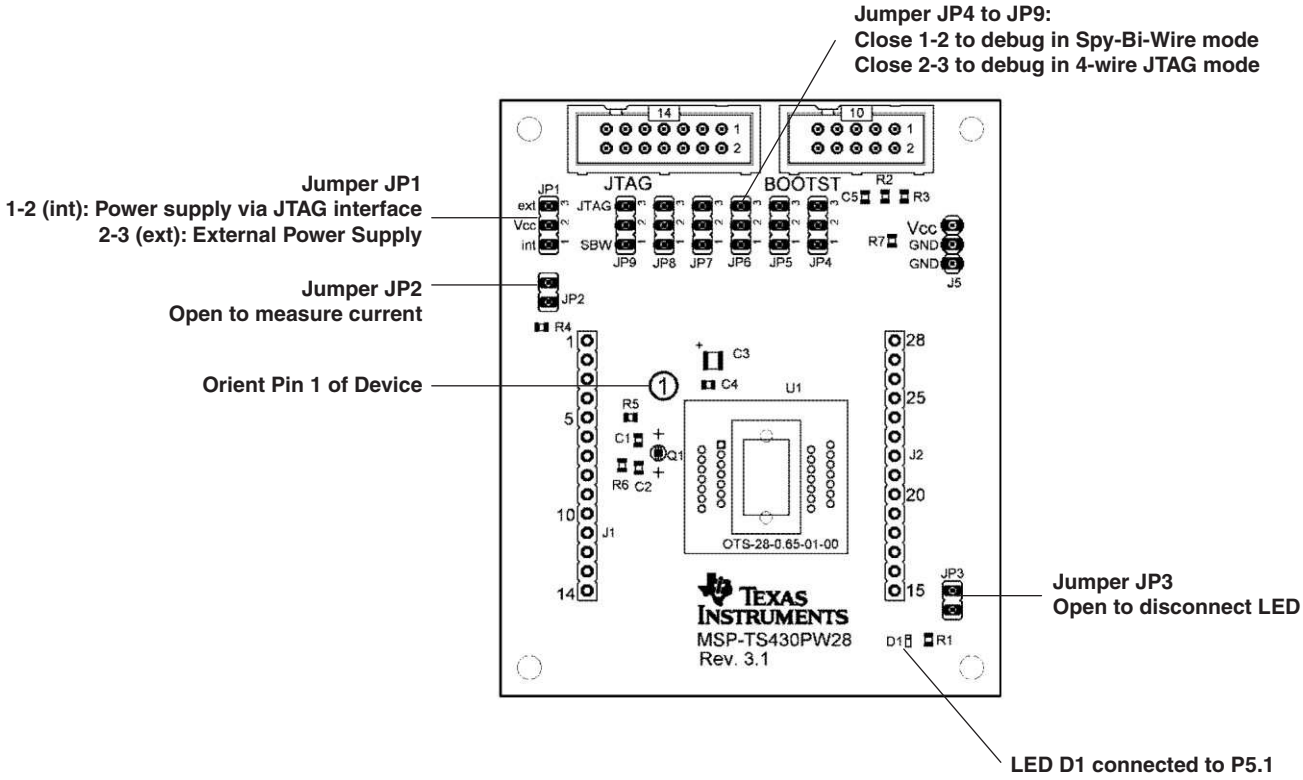

Figure B-14. MSP-TS430PW28 Target Socket Module, PCB

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Table B-8. MSP-TS430PW28 Bill of Materials(1)

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2 , Cover holes while soldering
2	C3	1	10uF, 10V Tantal Elko B		
3	C4	1	100nF, SMD0805		
4	C5	0	2.2nF, SMD0805		DNP
5	D1	1	LED green SMD0603		
6	Q1	0	QUARZ, Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Cover holes and neighboring holes while soldering
7	J1, J2	2	14-pin header, TH male		DNP: Headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
7.1		2	14-pin header, TH female		DNP: headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
8	J5, IP1	1	3-Pin Connector , male		
8a	JP1, JP4, JP5, JP6, JP7, JP8, JP9	7	3-Pin Connector , male		Jumper on Pos 1-2
9	JP2, JP3	2	2-Pin Connector , male		with Jumper
10	BOOTST	0	ML10, 10-Pin Conn. , m	RS: 482-115	DNP: Cover holes while soldering
11	JTAG	1	ML14, 14-Pin Conn. , m	RS: 482-121	
12	R1, R7	2	330R, SMD0805		
12	R2, R3, R5, R6	0	0R, SMD0805		DNP
14	R4	1	47K, SMD0805		
15	U1	1	SOP28PW socket	Enplas: OTS-28-0.65-01	

(1) PCB 66 x 79 mm, two layers; Rubber stand off, four pieces

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B.8 MSP-TS430PW28A

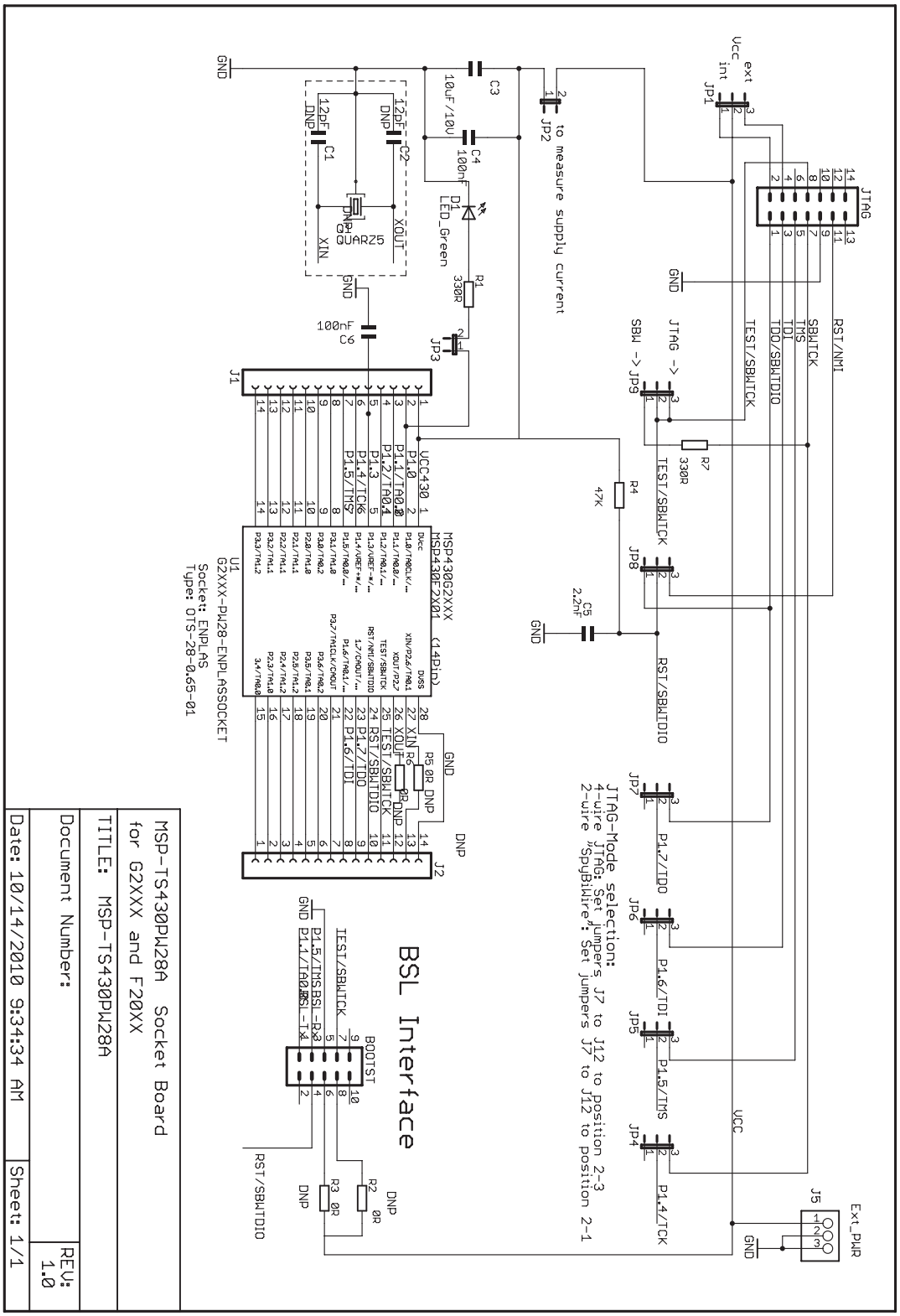

Figure B-15. MSP-TS430PW28A Target Socket Module, Schematic

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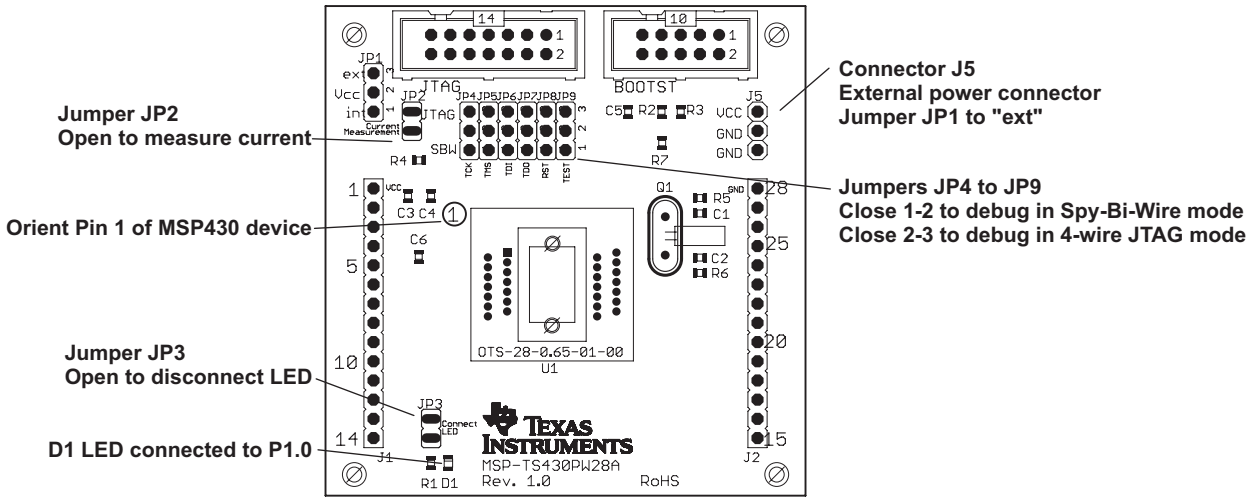

Figure B-16. MSP-TS430PW28A Target Socket Module, PCB (Red)

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Table B-9. MSP-TS430PW28A Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C5	1	2.2nF, SMD0805		
3	C3	1	10uF, 10V, SMD0805		
4	C4, C6,	2	100nF, SMD0805	478-3351-2-ND	
5	D1	1	green LED, SMD0805	P516TR-ND	
6	J1, J2	0	14-pin header, TH		DNP: Headers and receptacles enclosed with kit. Keep vias free of solder: (Header & Receptacle)
7	J5, JP1, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	Place jumper on 1-2 of JP4-JP9 Place on 1-2 on JP1
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	see Pos 7 an 8
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0			DNP Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS3V 32.768kHz, C(Load) = 12.5pF	DNP: keep vias free of solder
13	R1, R7	2	330 Ω, SMD0805	541-330ATR-ND	
14	R2, R3,R5, R6,	0	0 Ohm, SMD0805	541-000ATR-ND	DNP R2, R3,R5, R6
15	R4	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: OTS-28-0.65-01		Manuf.: Enplas
17	PCB	1	63.5 x 64.8 mm		2 layers
18	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430G2553IPW28		DNP: enclosed with kit, supplied by TI

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B.9 MSP-TS430DA38

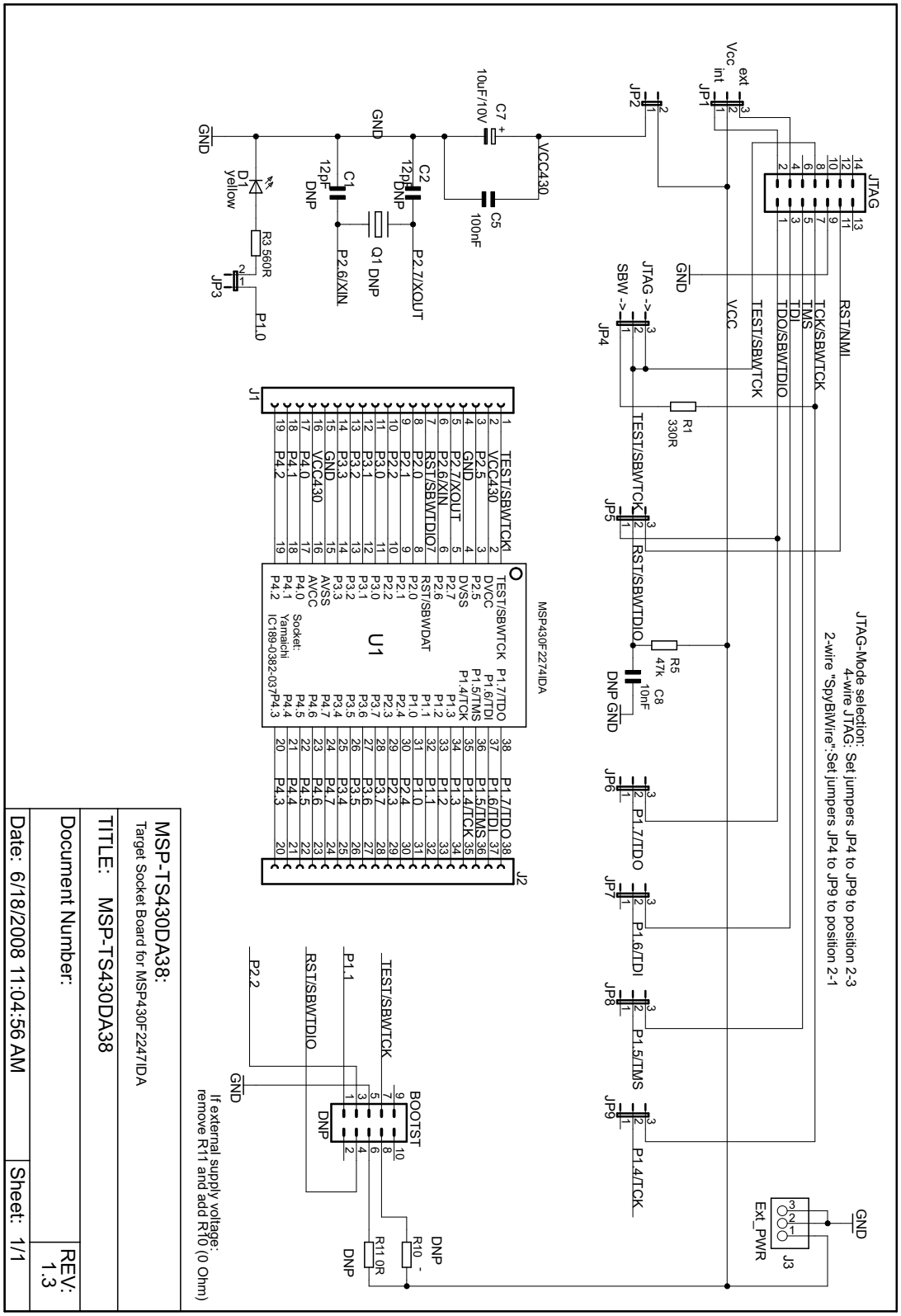

Figure B-17. MSP-TS430DA38 Target Socket Module, Schematic

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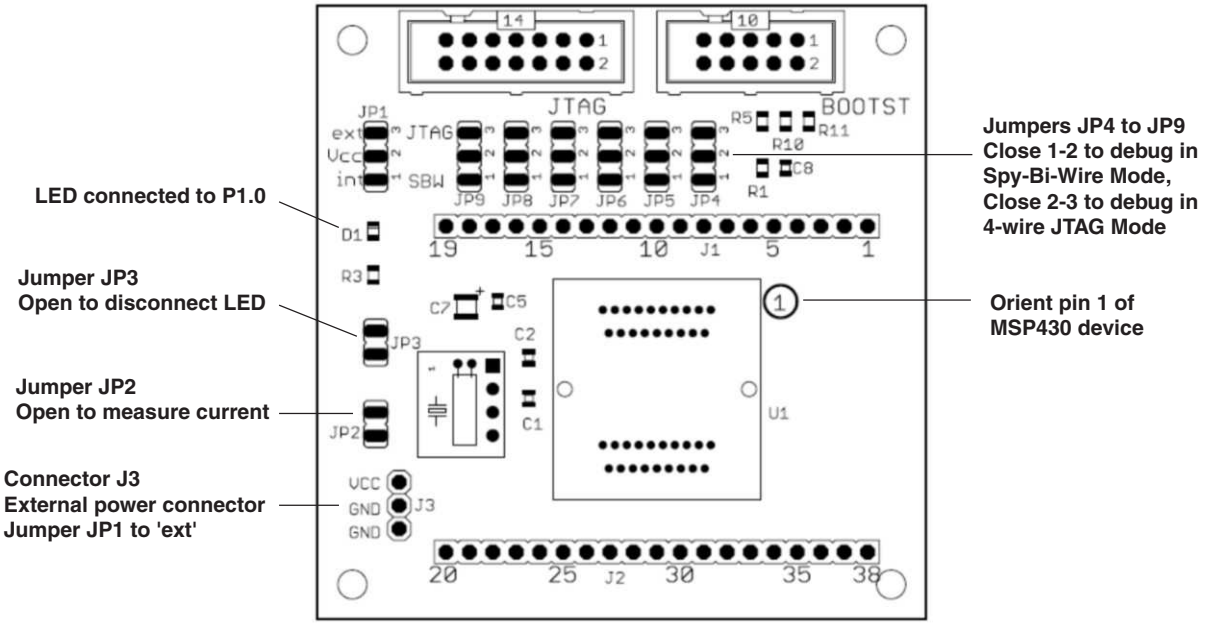

Figure B-18. MSP-TS430DA38 Target Socket Module, PCB

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Table B-10. MSP-TS430DA38 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C7	1	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	0	2.2nF, SMD0805		DNP
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2	0	19-pin header, TH	SAM1029-19-ND SAM1213-19-ND	DNP: headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
7	"J3, JP1, JP4, JP5, JP6, JP7, JP8, JP9"	8	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on headers JP1, JP4,JP5, JP6, JP7, JP8, JP9; Pos 1-2
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	Place on: JP1 - JP9; Pos 1-2
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R1, R3	2	330 Ω, SMD0805	541-330ATR-ND	
14	R10, R11	0	0 Ω, SMD0805	541-000ATR-ND	DNP
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC189-0382--037		Manuf.: Yamaichi
17	PCB	1	67 x 66 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F2274IDA		DNP: enclosed with kit supplied by TI

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B.10 MSP-TS430QFN23x0

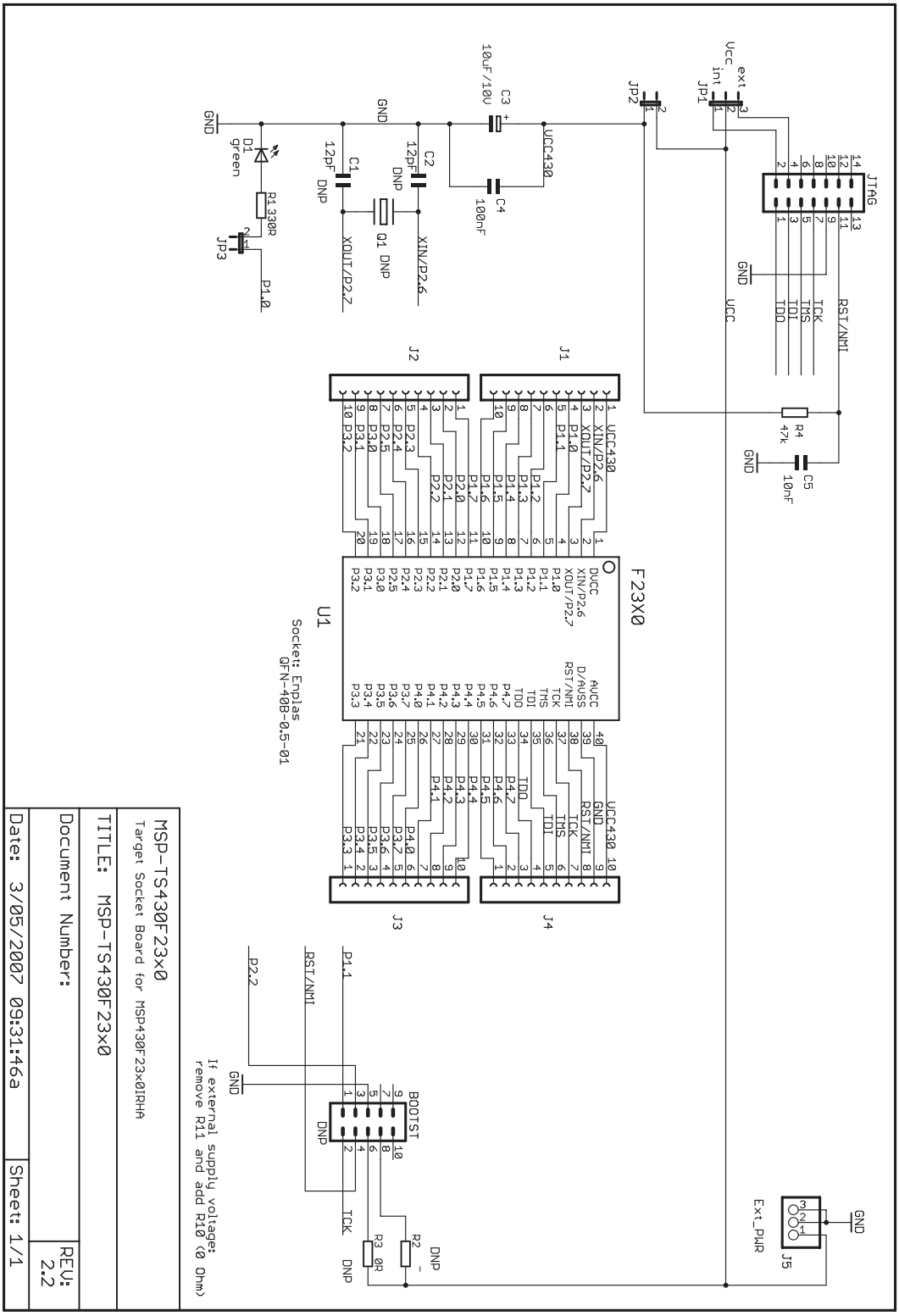

Figure B-19. MSP-TS430QFN23x0 Target Socket Module, Schematic

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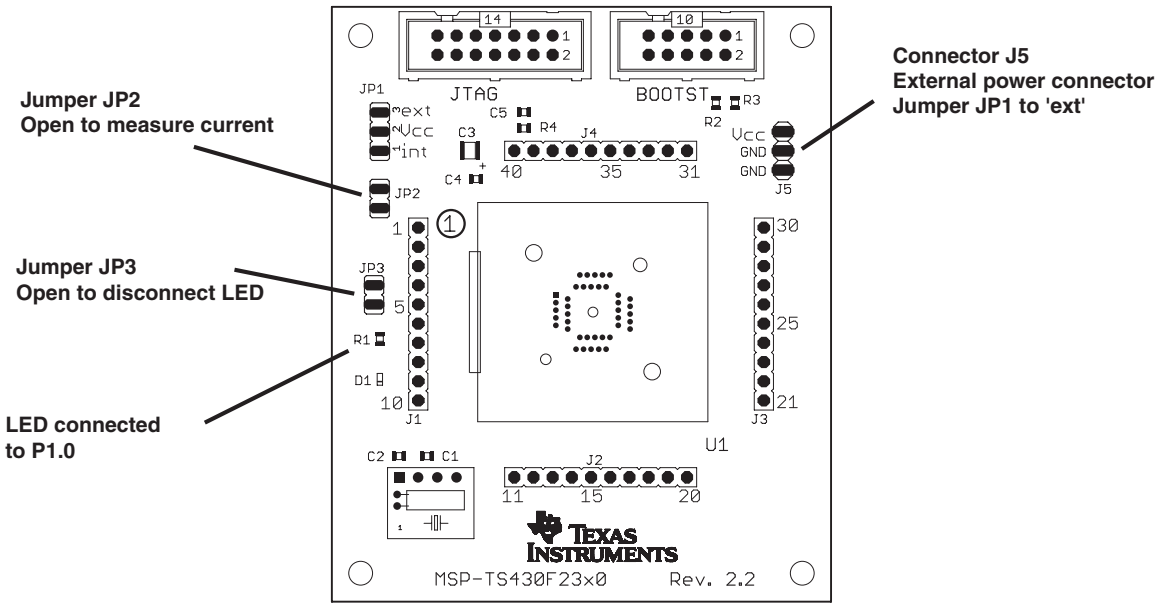

Figure B-20. MSP-TS430QFN23x0 Target Socket Module, PCB

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Table B-11. MSP-TS430QFN23x0 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3	1	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C4	1	100nF, SMD0805	478-3351-2-ND	
4	C5	1	10nF, SMD0805	478-1383-2-ND	
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2, J3, J4	0	10-pin header, TH	SAM1034-10-ND SAM1212-10-ND	DNP: headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
7	J5, JP1	2	3-pin header, male, TH	SAM1035-03-ND	Place jumper on header JP1; Pos 1-2.
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		3	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R1	1	330 Ω, SMD0805	541-330ATR-ND	
14	R2, R3	0	0 Ω, SMD0805	541-000ATR-ND	DNP
15	R4	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: QFN-40B-0.5-01		Manuf.: Enplas
17	PCB	1	79 x 66 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F2370IRHA		DNP: enclosed with kit supplied by TI

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B.11 MSP-TS430RSB40

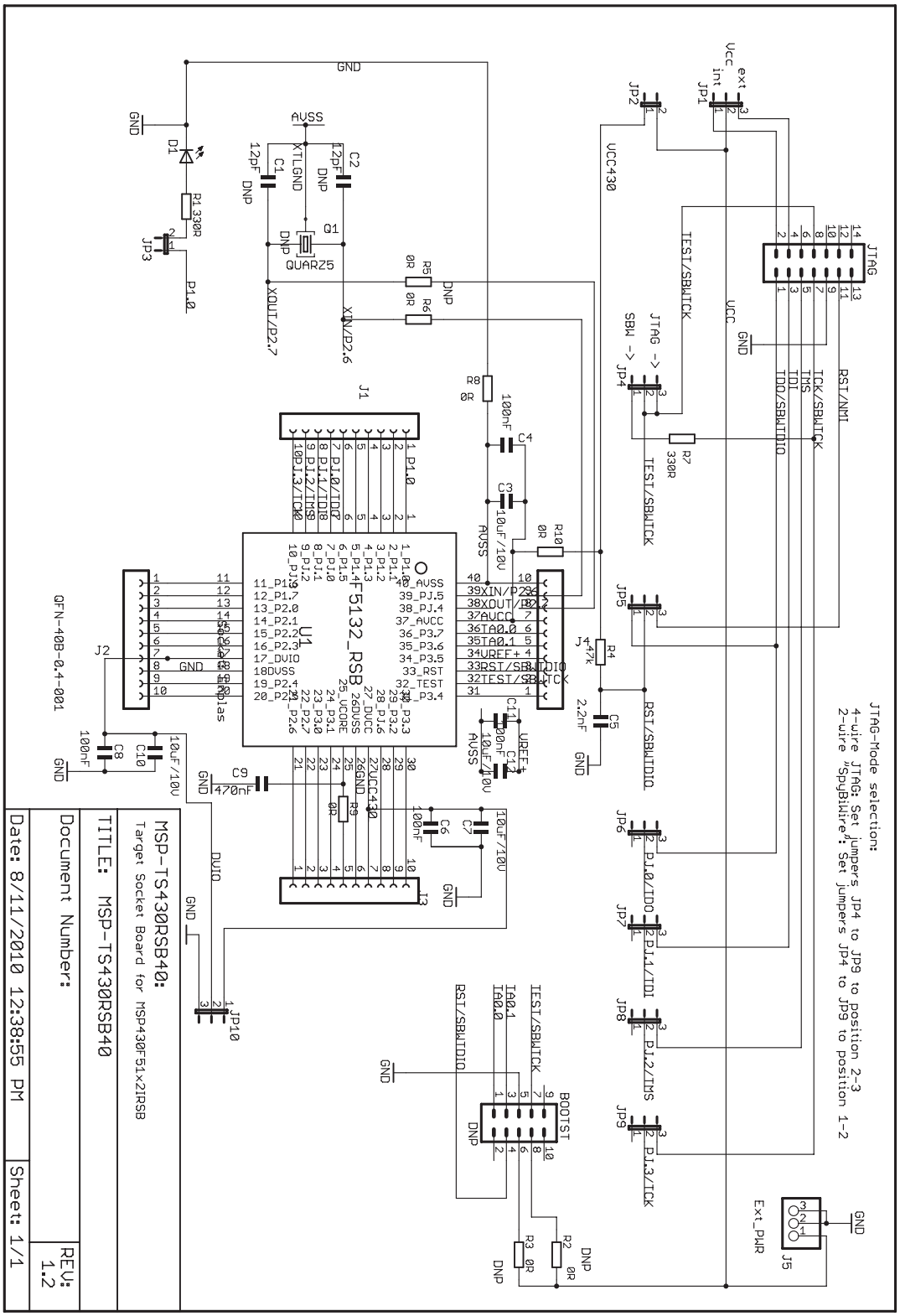

Figure B-21. MSP-TS430RSB40 Target Socket Module, Schematic

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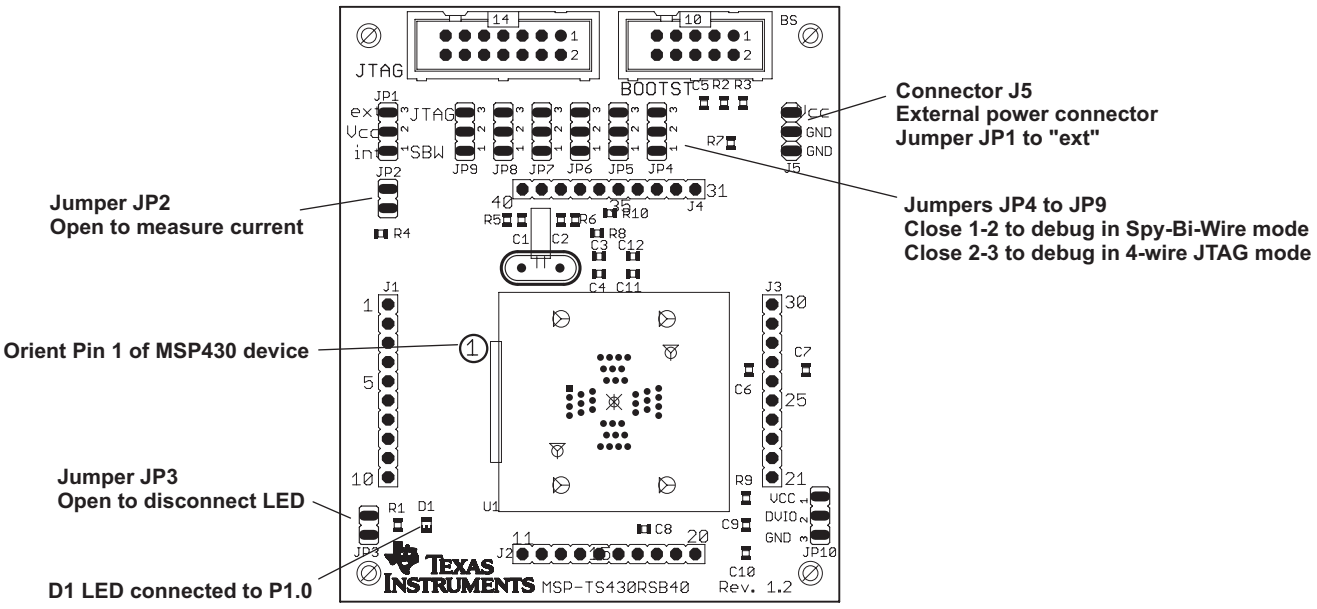

Figure B-22. MSP-TS430RSB40 Target Socket Module, PCB

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Table B-12. MSP-TS430RSB40 Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
2	C3, C7, C10, C12	3	10uF, 10V, SMD 0805	445-1371-1-ND	DNP C12
3	C4, C6, C8, C11	3	100nF, SMD0805	311-1245-2-ND	DNP C11
4	C5	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805		
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	JP1, JP4,JP5, JP6, JP7, JP8, JP9, J5, JP10	9	3-pin header, male, TH	SAM1035-03-ND	Jumper: 1-2 on JP1, JP10; 2-3 on JP4-JP9
9	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP. Keep vias free of solder
12	U1	1	QFN-40B-0.4_ ENPLAS_SOCKET	Enplas	
13	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1. Keep vias free of solder
15		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
16	R1,R7	2	330R SMD0805		
17	R2, R3, R5, R6, R8, R9, R10	3	0R SMD0805		DNP R2, R3, R5, R6
18	R4	1	47k SMD0805		
19	MSP430	2	MSP430F5132		DNP: enclosed with kit. Is supplied by TI
20	Rubber stand off	4		select appropriate; for example, Buerklin: 20H1724	apply to corners at bottom side

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B.12 MSP-TS430RHA40A

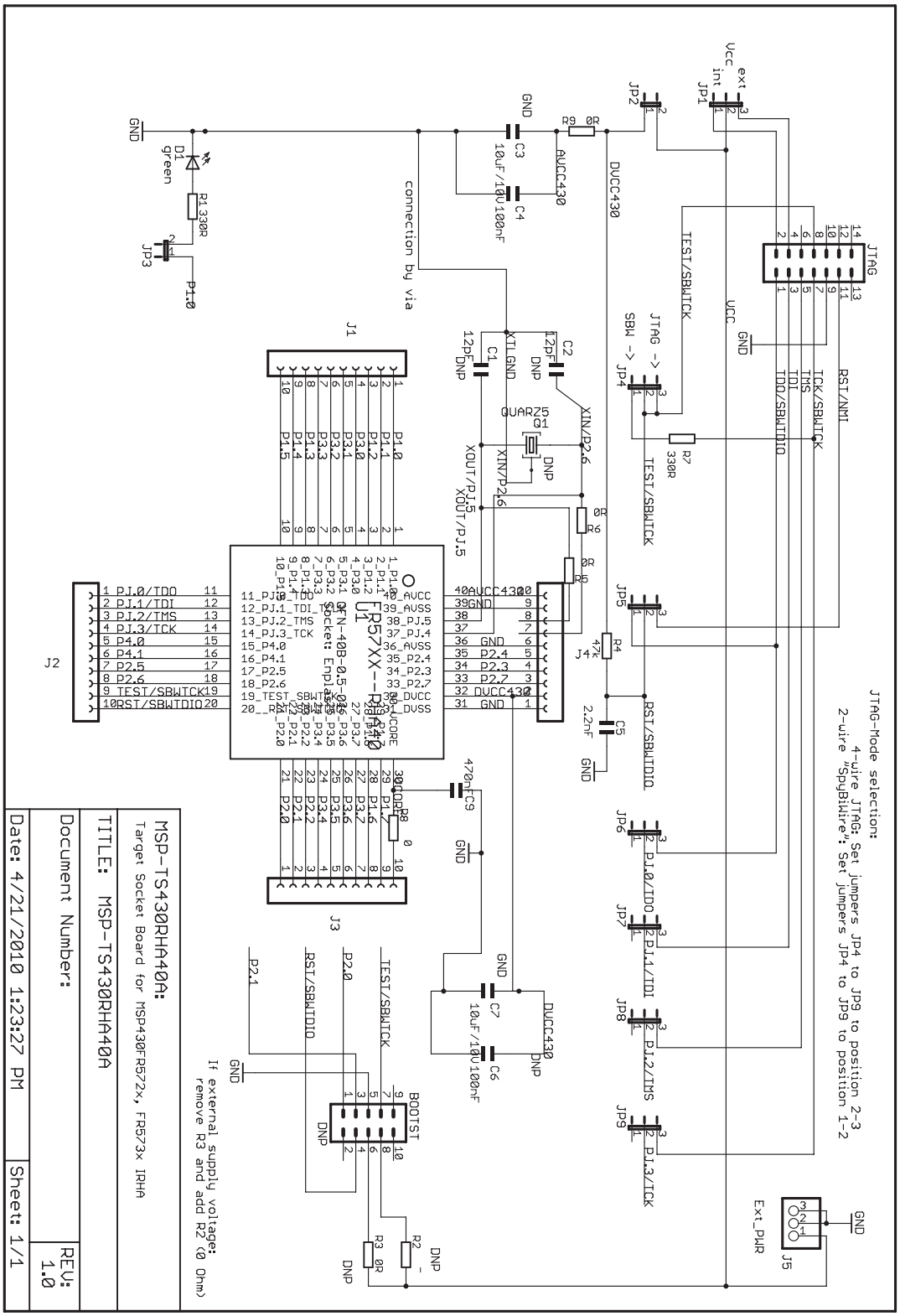

Figure B-23. MSP-TS430RHA40A Target Socket Module, Schematic

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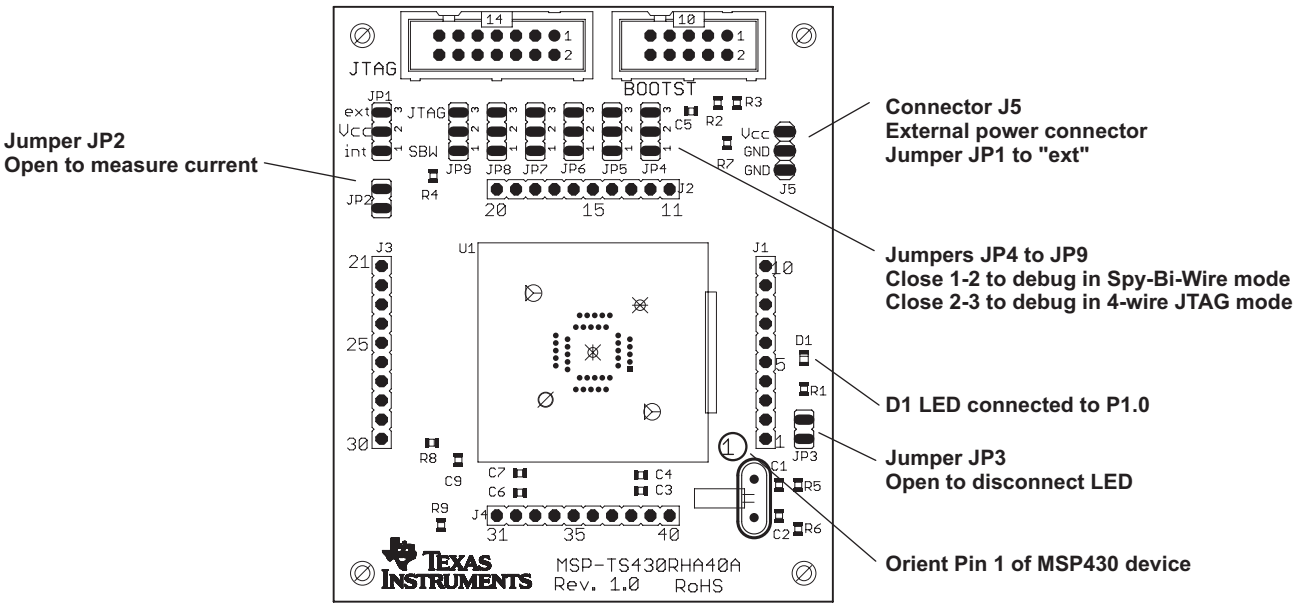

Figure B-24. MSP-TS430RHA40A Target Socket Module, PCB

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Table B-13. MSP-TS430RHA40A Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
2	C5	0	2.2nF, SMD0805		DNP C12
3	C3, C7	2	10uF, 10V, SMD0805 5		DNP C11
4	C4, C6	2	100nF, SMD0805	478-3351-2-ND	
5	C9	1	470nF, SMD0805		
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5, JP1, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	Place jumper on 1-2 of JP4-JP9; Place on 1-2 on JP1
9	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10		9	Jumper	15-38-1024-ND	see Pos 8 an 9
11	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
12	BOOTST	0	10-pin connector, male, TH		DNP. Keep vias free of solder
13	U1	1	Socket: QFN-40B-0.5-01		Manuf.: Enplas
14	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1. Keep vias free of solder
15	R1,R7	2	330R SMD0805	541-330ATR-ND	
16	R2, R3, R5, R6, R8, R9,	2	0 Ohm, SMD0805	541-000ATR-ND	DNP:R2, R3, R5, R6
17	R4	1	47k SMD0805		
18	PCB	1	79 x 66 mm		2 layers
19	Rubber stand off	4		select appropriate; for example, Buerklin: 20H1724	apply to corners at bottom side
20	MSP430	2	MSP430N5736IRHA		DNP: enclosed with kit. Is supplied by TI

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B.13 MSP-TS430DL48

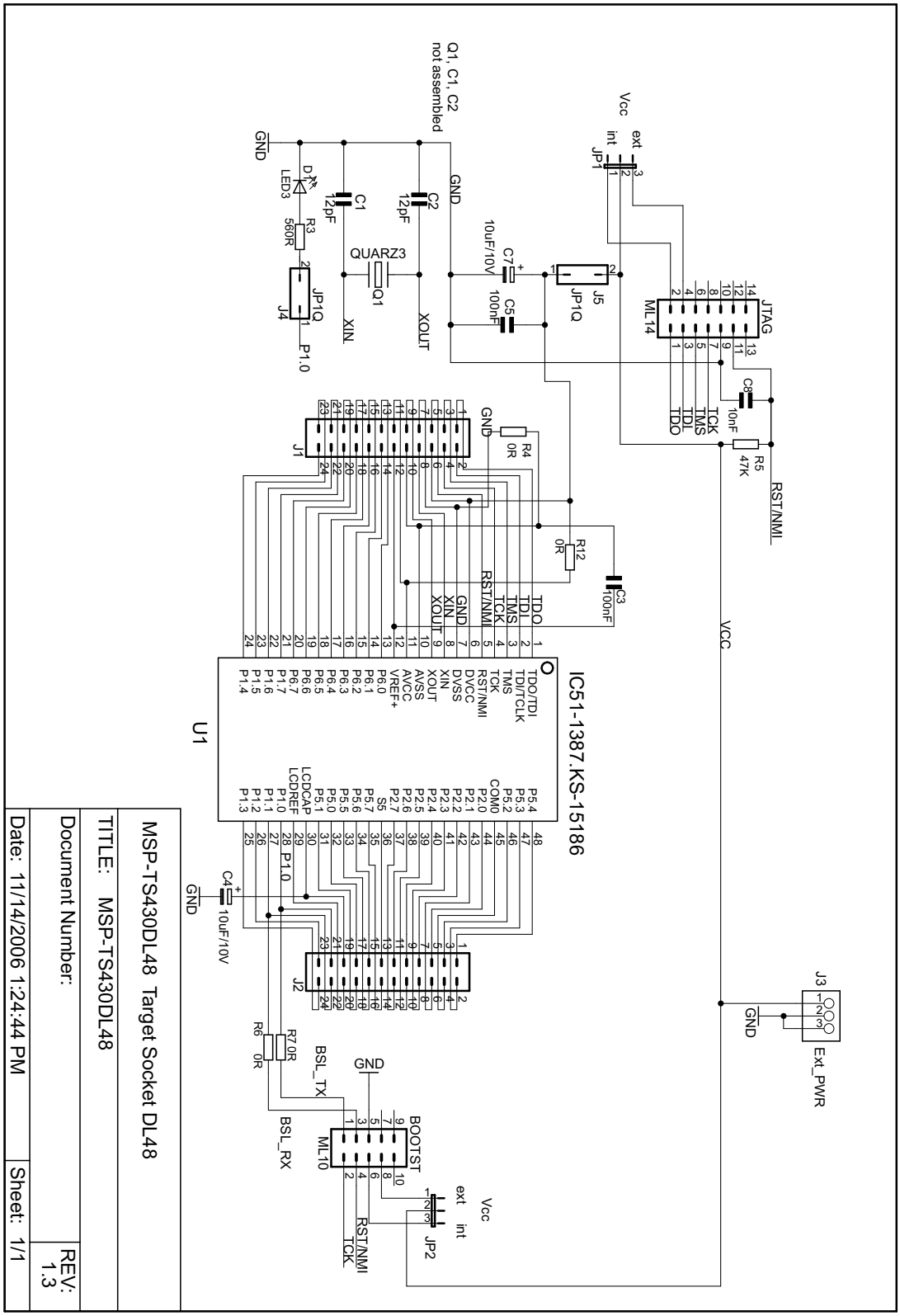

Figure B-25. MSP-TS430DL48 Target Socket Module, Schematic

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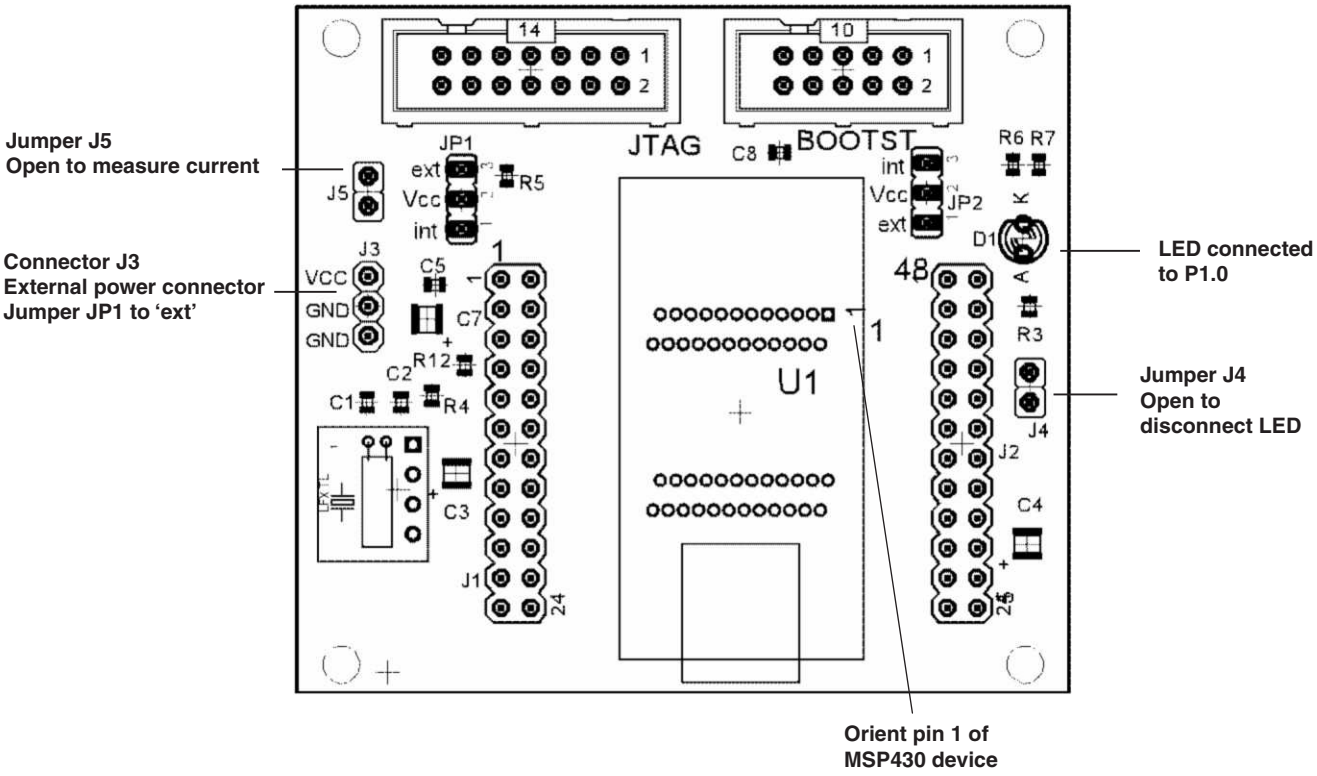

Figure B-26. MSP-TS430DL48 Target Socket Module, PCB

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Table B-14. MSP-TS430DL48 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C4, C7	2	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C3, C5	2	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	D1	1	yellow LED, TH, 3mm, T1	511-1251-ND	
6	J1, J2	0	24-pin header, TH	SAM1034-12-ND SAM1212-12-ND	DNP: Headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
7	J3, JP1, JP2	2	3-pin header, male, TH	SAM1035-03-ND	Place jumper on header JP1; Pos 1-2. DNP: JP2
8	J4, J5	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		3	Jumper	15-38-1024-ND	Place on: JP1, J4, J5
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R3	1	560 Ω, SMD0805	541-560ATR-ND	
14	R4, R6, R7, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R6, R7
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC51-1387 KS-15186		Manuf.: Yamaichi
17	PCB	1	58 x 66 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F4270IDL		DNP: Enclosed with kit supplied by TI

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B.14 MSP-TS430RGZ48B

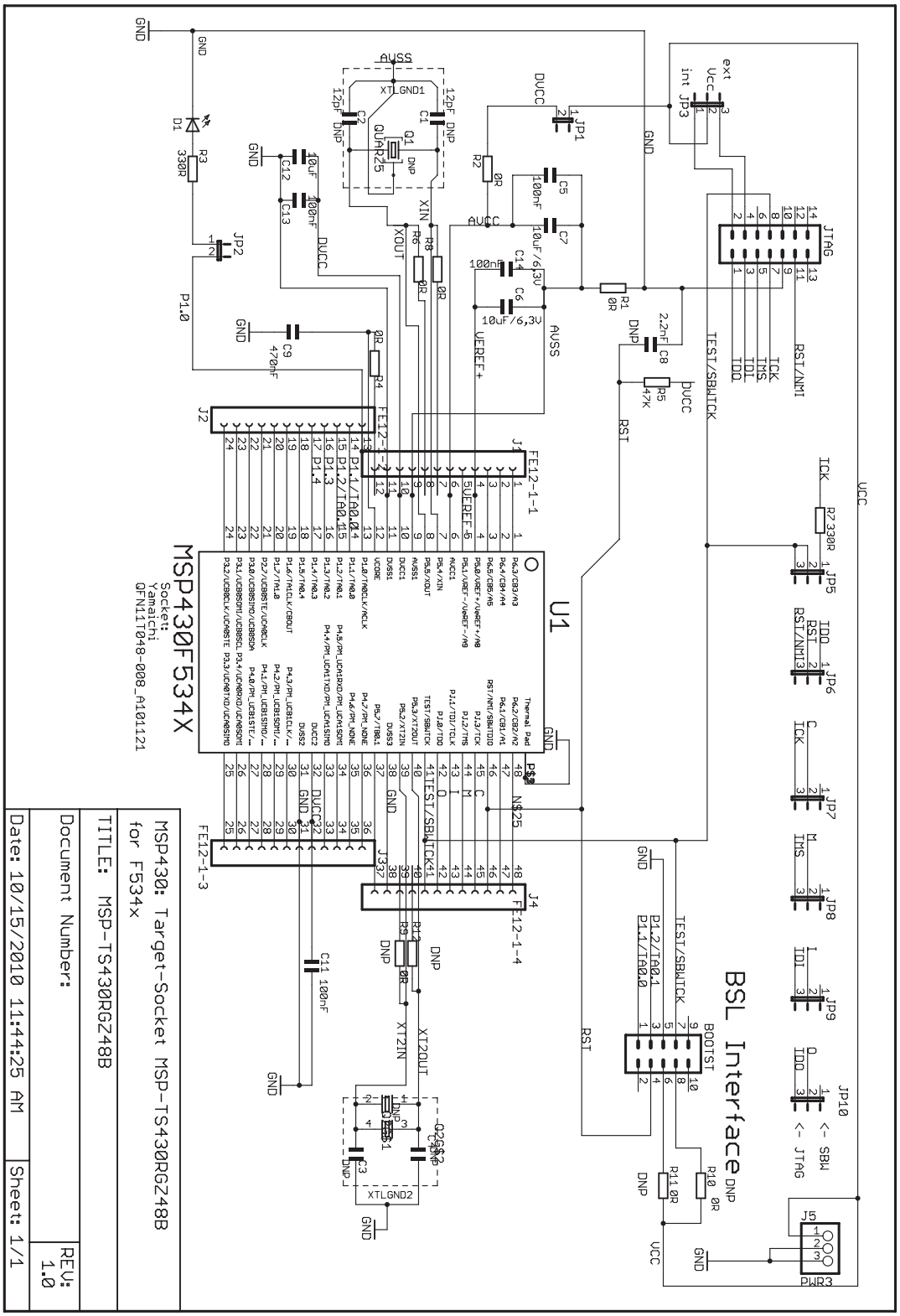

Figure B-27. MSP-TS430RGZ48B Target Socket Module, Schematic

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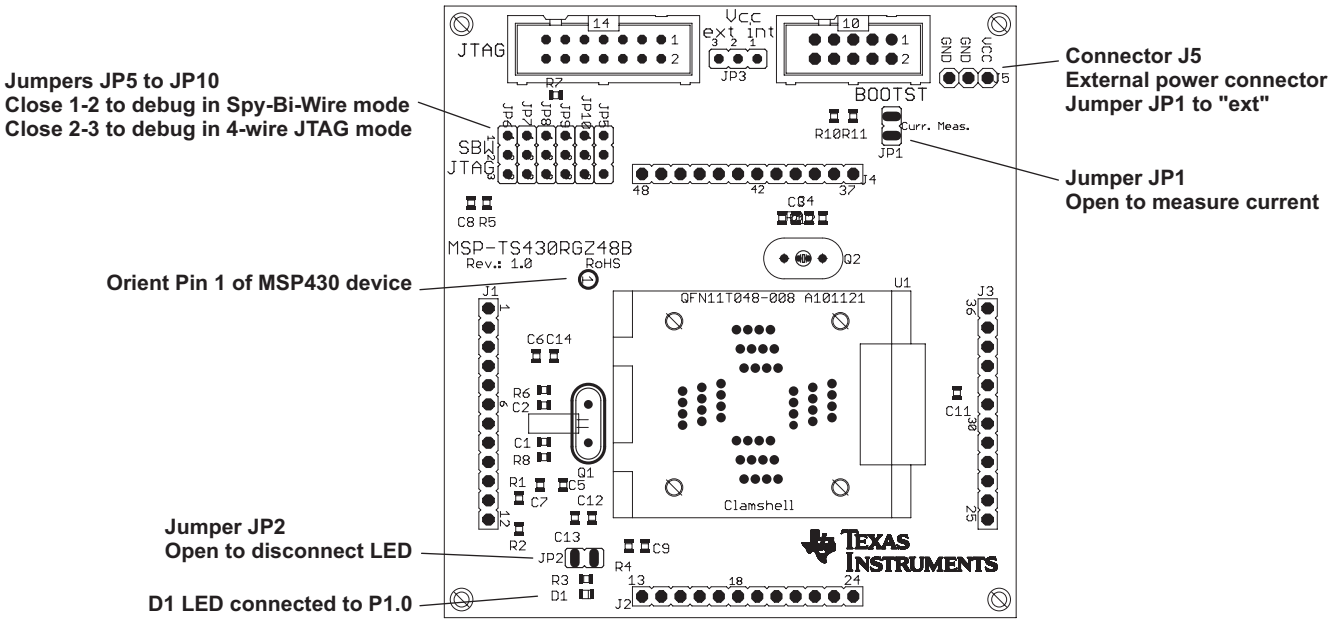

Figure B-28. MSP-TS430RGZ48B Target Socket Module, PCB

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Table B-15. MSP-TS430RGZ48B Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3, C4	0	47pF, SMD0805		DNP
3	C6, C7, C12	3	10uF, 6.3V, SMD0805		
4	C5, C11, C13, C14	4	100nF, SMD0805	311-1245-2-ND	
5	C8	1	2.2nF, SMD0805		
6	C9	1	470nF, SMD0805	478-1403-2-ND	
7	D1	1	green LED, SMD0805	P516TR-ND	
8	J1, J2, J3, J4	0	12-pin header, TH	SAM1029-12-ND (Header) SAM1213-12-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
9	J5	1	3-pin header, male, TH		
10	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
11	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
12		9	Jumper	15-38-1024-ND	See Pos. 10and Pos. 11
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
15	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
16	Q2	0	Crystal	Q2: 4MHz Buerklin: 78D134	DNP: Q2 Keep vias free of solder
17	Insulating disk to Q2	0	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
18	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
19	R1, R2, R4, R6, R8, R9,R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11,R12
20	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
21	U1	1	Socket: QFN11T048-008_A101121_RGZ48		Manuf.: Yamaichi
22	PCB	1	81 x 76 mm		2 layers
23	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
24	MSP430	2	MSP430F5342IRGZ		DNP: enclosed with kit, supplied by TI

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B.15 MSP-TS430RGZ48C

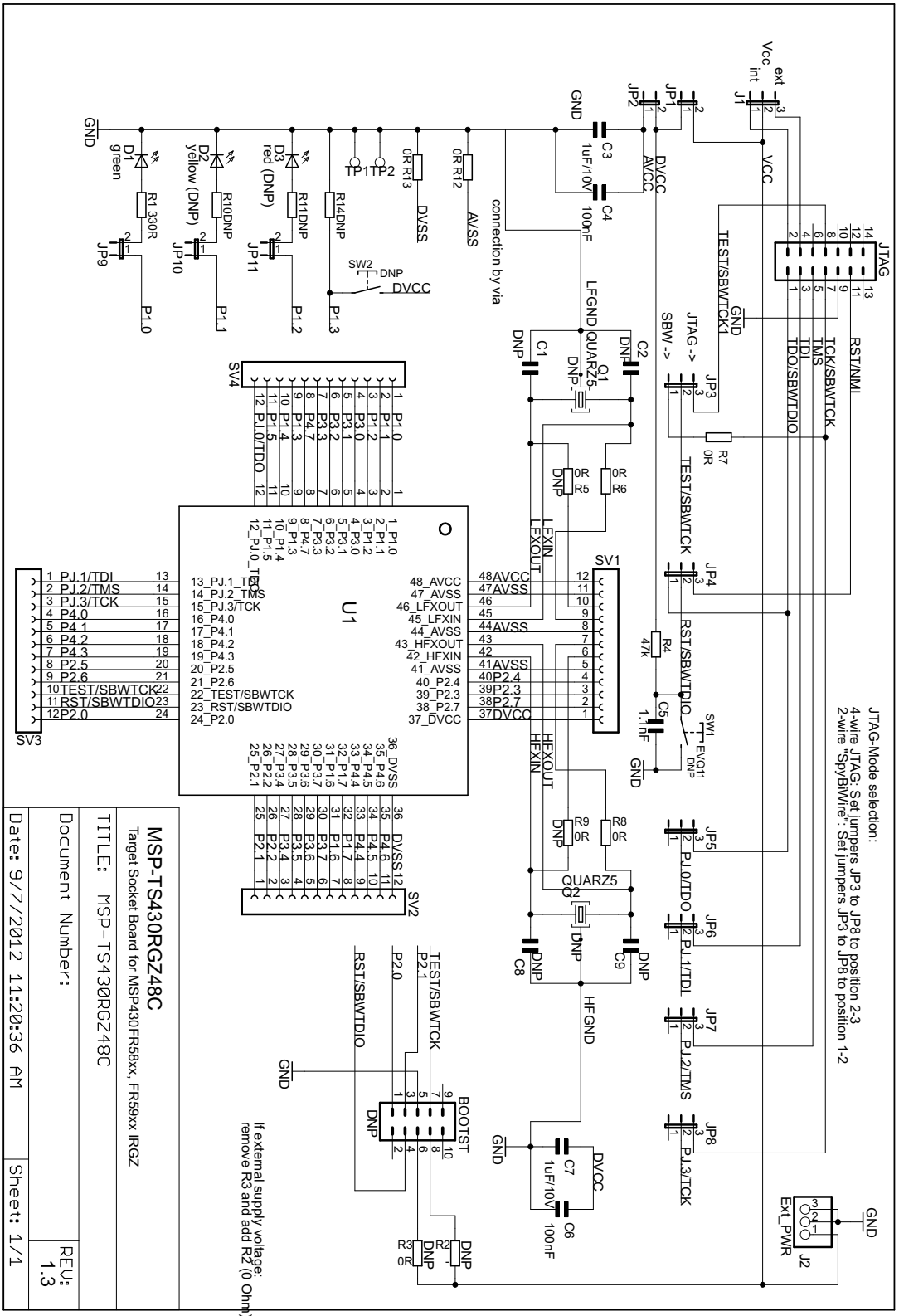

Figure B-29. MSP-TS430RGZ48C Target Socket Module, Schematic

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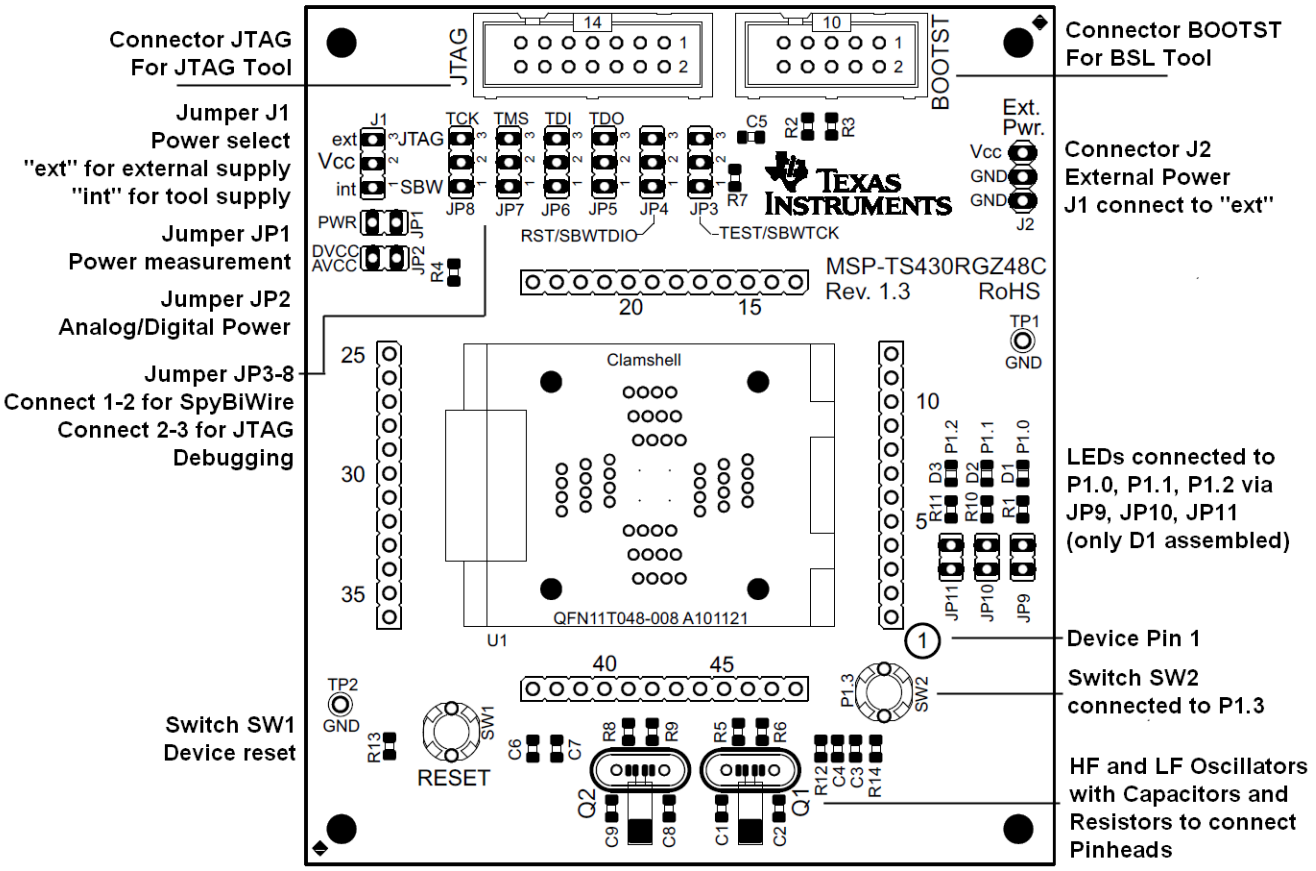

Figure B-30. MSP-TS430RGZ48C Target Socket Module, PCB

Table B-16. MSP-TS430RGZ48C Revision History

Revision	Comments
1.2	Initial release
1.3	LFOSC pins swapped at SV1 (9-10). HFOSC pins swapped at SV1 (6-7). BOOTST pin 4 now directly connected to the device RST/SBWTDIO pin.

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Table B-17. MSP-TS430RGZ48C Bill of Materials

Pos	Ref Des	Number Per Board	Description	DigiKey Part Number	Comment
1	SV1, SV2, SV3, SV4	4	12-pin header, TH	SAM1029-12-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
1.1	SV1, SV2, SV3, SV4	4	12-pin receptable, TH	SAM1213-12-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
2	JP1, JP2, JP9	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
3	JP10, JP11	2	2-pin header, male, TH	SAM1035-02-ND	DNP
4	J1, JP3, JP4, JP5, JP6, JP7, JP8	7	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 2-3
5	J2	1	3-pin header, male, TH	SAM1035-03-ND	
6	JP1, JP2, JP9, J1, JP3, JP4, JP5, JP6, JP7, JP8	10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP9, J1, JP3, JP4, JP5, JP6, JP7, JP8
7	R2, R3, R5, R6, R8, R9, R10, R11, R14	9	DNP, 0805		DNP
8	R12, R13, R7	3	0R, 0805	541-000ATR-ND	
9	C5	1	1.1nF, CSMD0805	490-1623-2-ND	
10	C3, C7	2	1uF, 10V, CSMD0805	490-1702-2-ND	
11	R4	1	47k, 0805	541-47000ATR-ND	
12	C4, C6	2	100nF, CSMD0805	311-1245-2-ND	
13	R1	1	330R, 0805	541-330ATR-ND	
14	C1, C2, C8, C9	4	DNP, CSMD0805		DNP
15	SW1, SW2	2	EVQ-11L05R	P8079STB-ND	DNP, Lacon: 1251459
16	BOOTST	1	10-pin connector, male, TH	HRP10H-ND	DNP, keep vias free of solder
17	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
18	Q1	1	DNP: MS3V-TR1 (32768kHz, 20ppm, 12.5pF)	depends on application	Micro Crystal, DNP, enclosed in kit, keep vias free of solder
19	Q2	1	DNP, Christal	depends on application	DNP, keep vias free of solder
20	U1	1	Socket: QFN11T048-008 A101121-001		Manuf.: Yamaichi
20.1	U1	1	MSP430		DNP: enclosed with kit. Is supplied by TI.
21	D1	1	green LED, DIODE0805	P516TR-ND	
22	D3	1	red (DNP), DIODE0805		DNP
23	D2	1	yellow (DNP), DIODE0805		DNP
24	TP1, TP2	2	Testpoint		DNP, keep pads free of solder
25	Rubber stand off	4		Buerklin: 20H1724	apply to corners at bottom side
26	PCB	1	79.6 x 91.0 mm	MSP-TS430RGZ48C Rev. 1.2	2 layers, black solder mask

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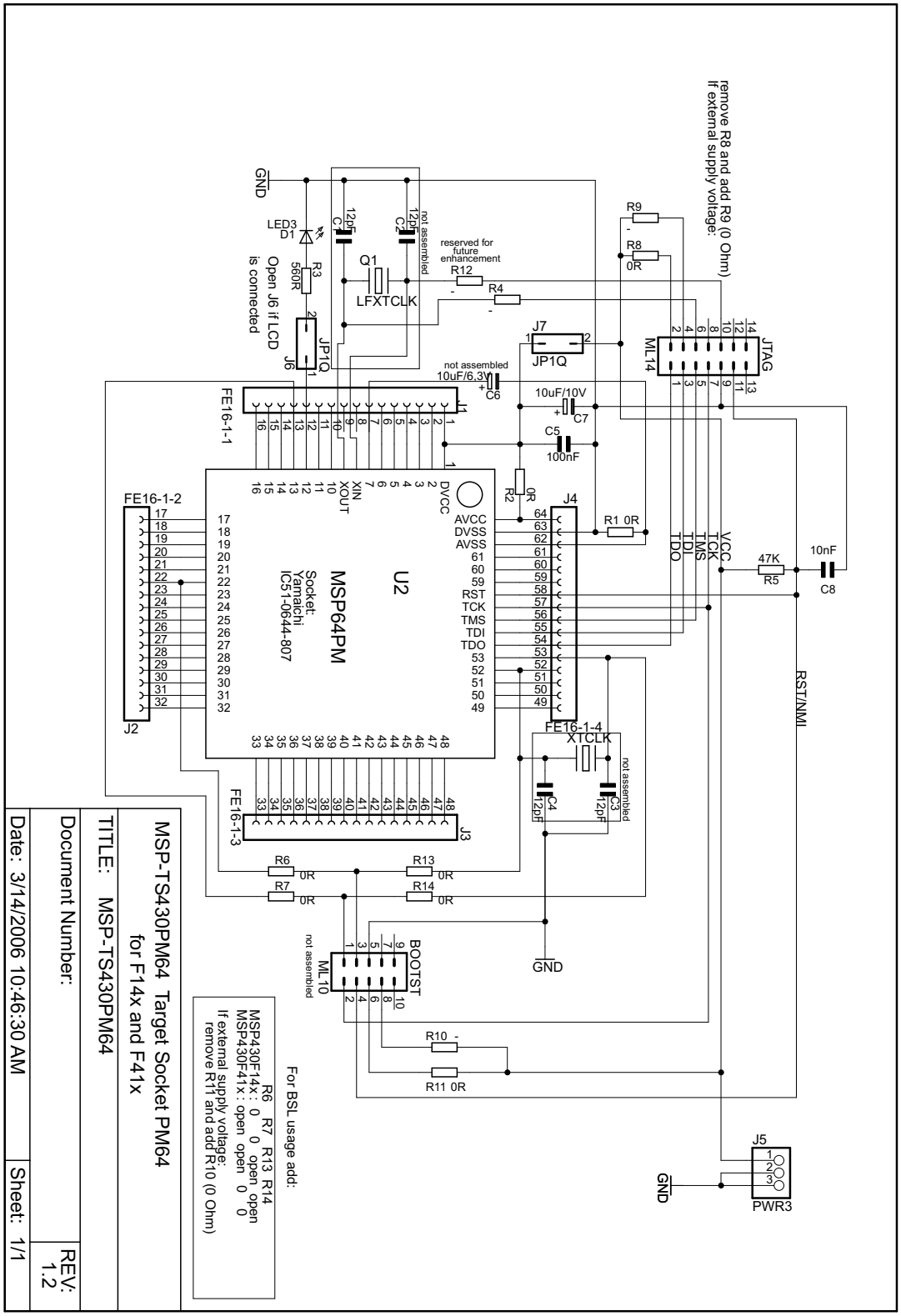
B.16 MSP-TS430PM64



NOTE: Connections between the JTAG header and pins XOUT and XIN are no longer required and should not be made.

Figure B-31. MSP-TS430PM64 Target Socket Module, Schematic

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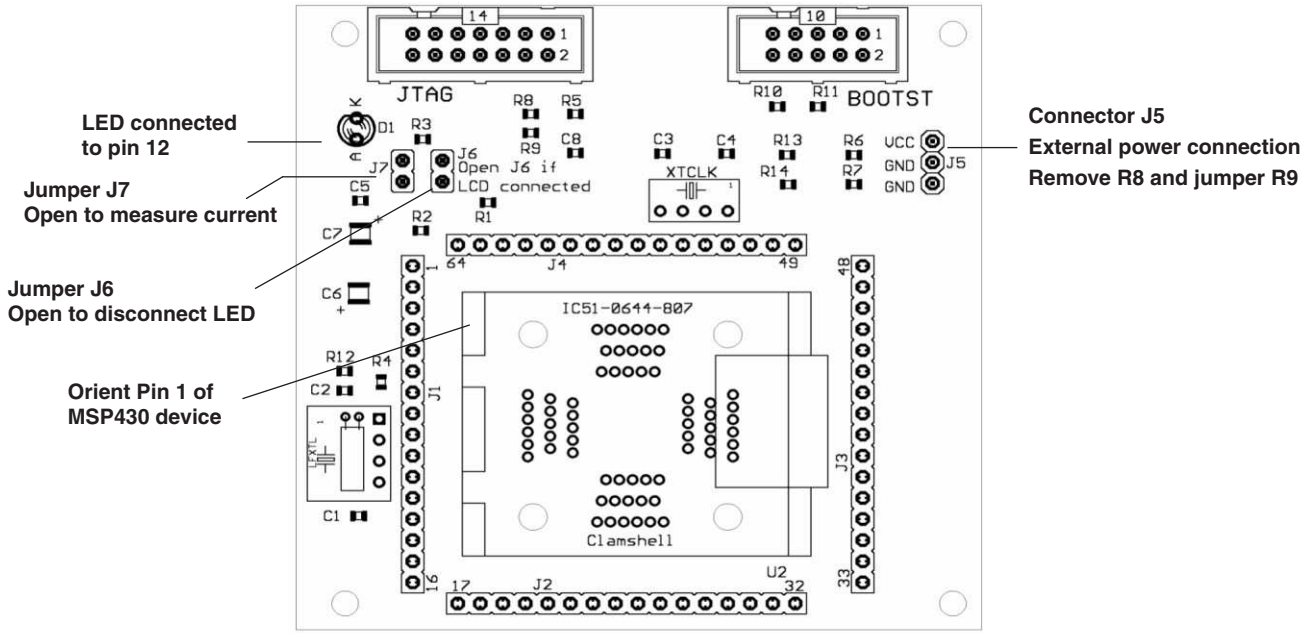

Figure B-32. MSP-TS430PM64 Target Socket Module, PCB

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Table B-18. MSP-TS430PM64 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1.1	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	1	10uF, 10V, Tantal Size B	511-1463-2-ND	DNP: C6
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	0	16-pin header, TH	SAM1029-16-ND SAM1213-16-ND	DNP: Headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	J6, J7	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11		2	Jumper	15-38-1024-ND	Place on: J6, J7
12	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
13	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
14	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
15	R3	1	330 Ω, SMD0805	541-330ATR-ND	
16	R1, R2, R4, R6, R7, R8, R9, R10, R11, R12, R13, R14	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R7, R9, R10, R11, R12, R13, R14
17	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
18	U1	1	Socket: IC51-0644-807		Manuf.: Yamaichi
19	PCB	1	78 x 75 mm		2 layers
20	Rubber standoff	4		select appropriate	Apply to corners at bottom side
21	MSP430	22	MSP430F2619IPM MSP430F417IPM		DNP: Enclosed with kit supplied by TI

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B.17 MSP-TS430PM64A

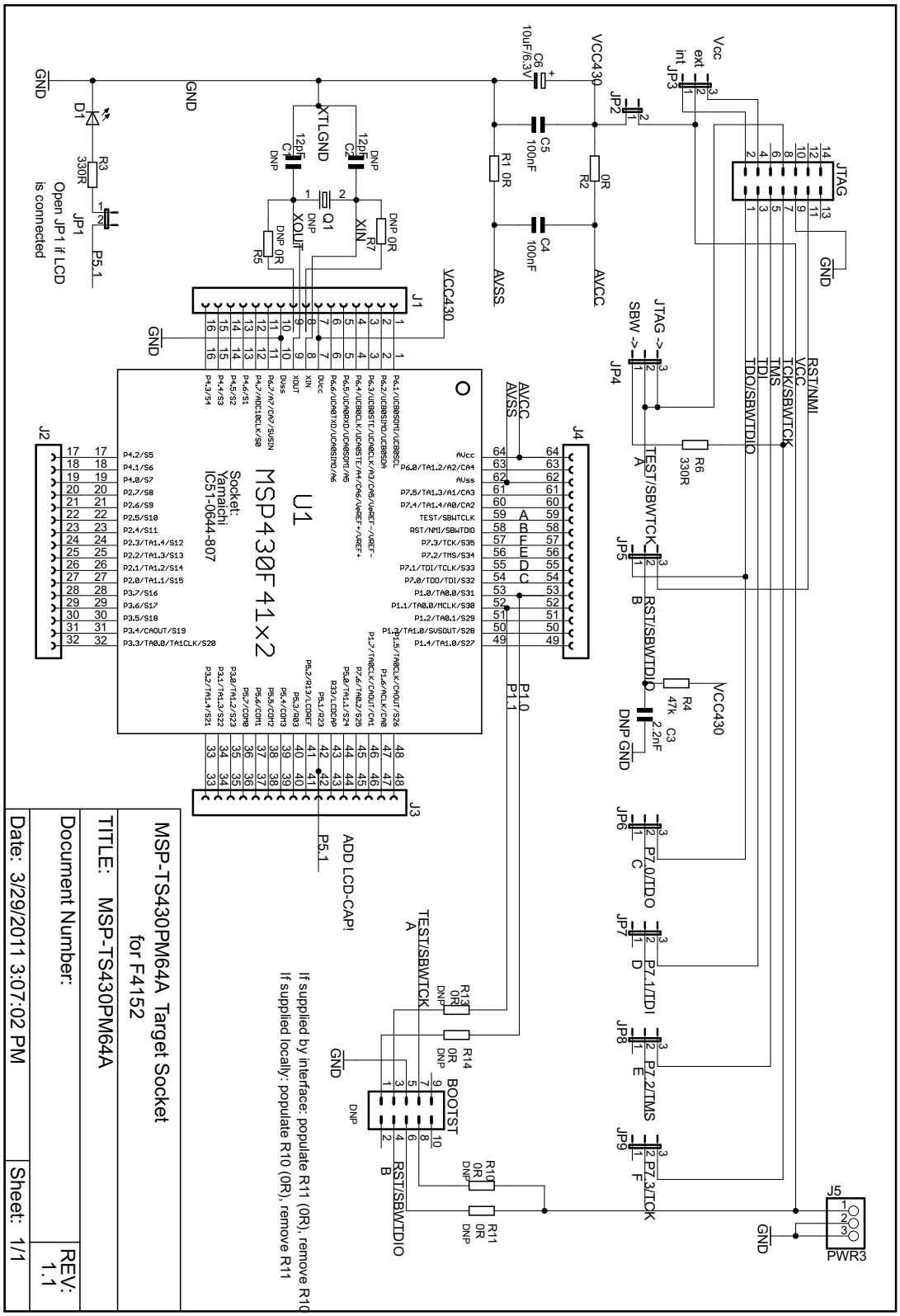

Figure B-33. MSP-TS430PM64A Target Socket Module, Schematic

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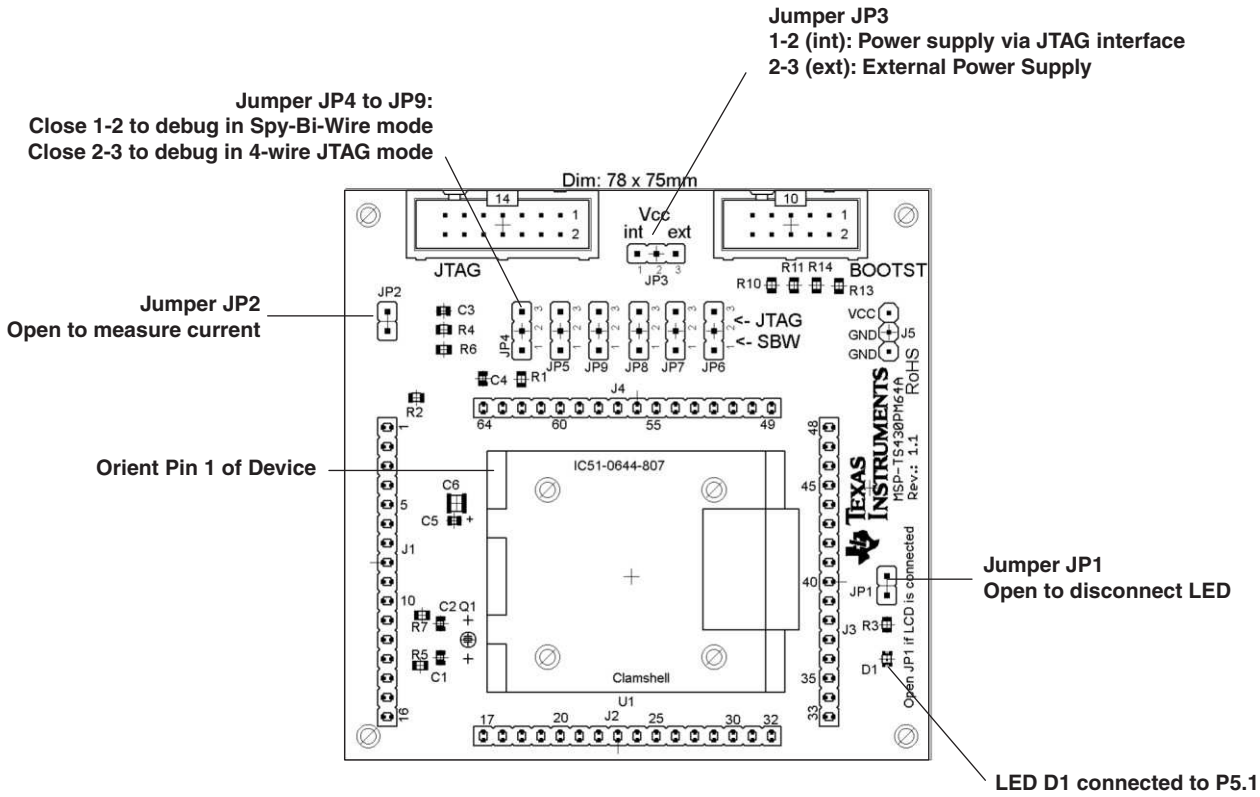

Figure B-34. MSP-TS430PM64A Target Socket Module, PCB

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Table B-19. MSP-TS430PM64A Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2,	0	12pF, SMD0805		DNP
2	C3	0	2.2nF, SMD0805		DNP
3	C6,	1	10uF, 10V, Tantal Size B	511-1463-2-ND	
4	C4, C5	2	100nF, SMD0805	478-3351-2-ND	
5	D1	1	green LED, SMD0805	P516TR-ND	
6	J1, J2, J3, J4	0	16-pin header, TH	SAM1029-16-ND SAM1213-16-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7	J5, JP3, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	
8	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		2	Jumper	15-38-1024-ND	Place on: J6, J7
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R3, R6	2	330 Ω, SMD0805	541-330ATR-ND	
14	R1, R2, R5, R7, R9, R10, R11, R13, R14	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R5, R7, R9, R10, R11, R13, R14
15	R4	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC51-0644-807		Manuf.: Yamaichi
17	PCB	1	78 x 75 mm		4 layers
18	Rubber stand off	4		select appropriate	Apply to corners at bottom side
19	MSP430	2	MSP430F4152IPM		DNP: Enclosed with kit supplied by TI

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B.18 MSP-TS430RGC64B

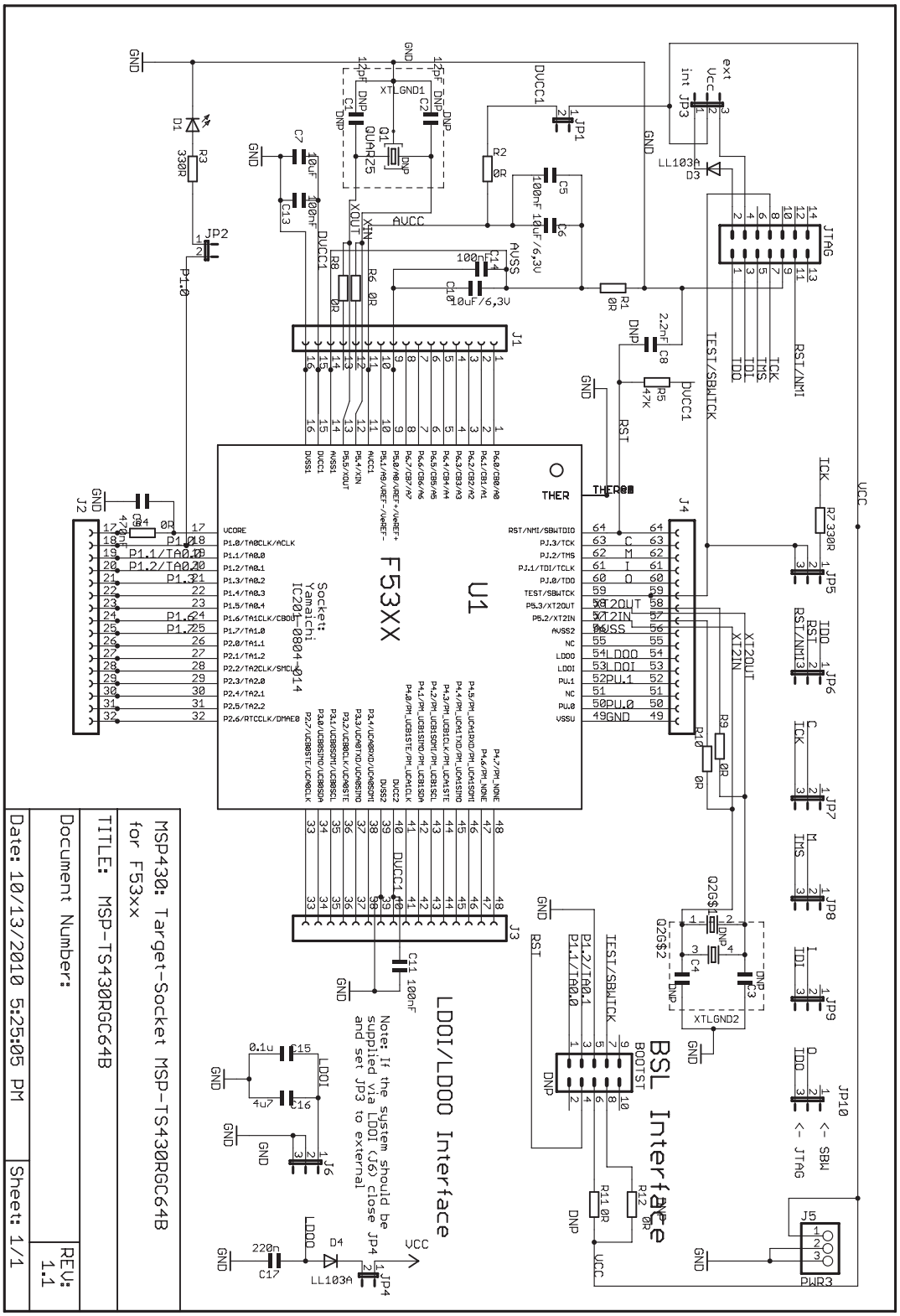

Figure B-35. MSP-TS430RGC64B Target Socket Module, Schematic

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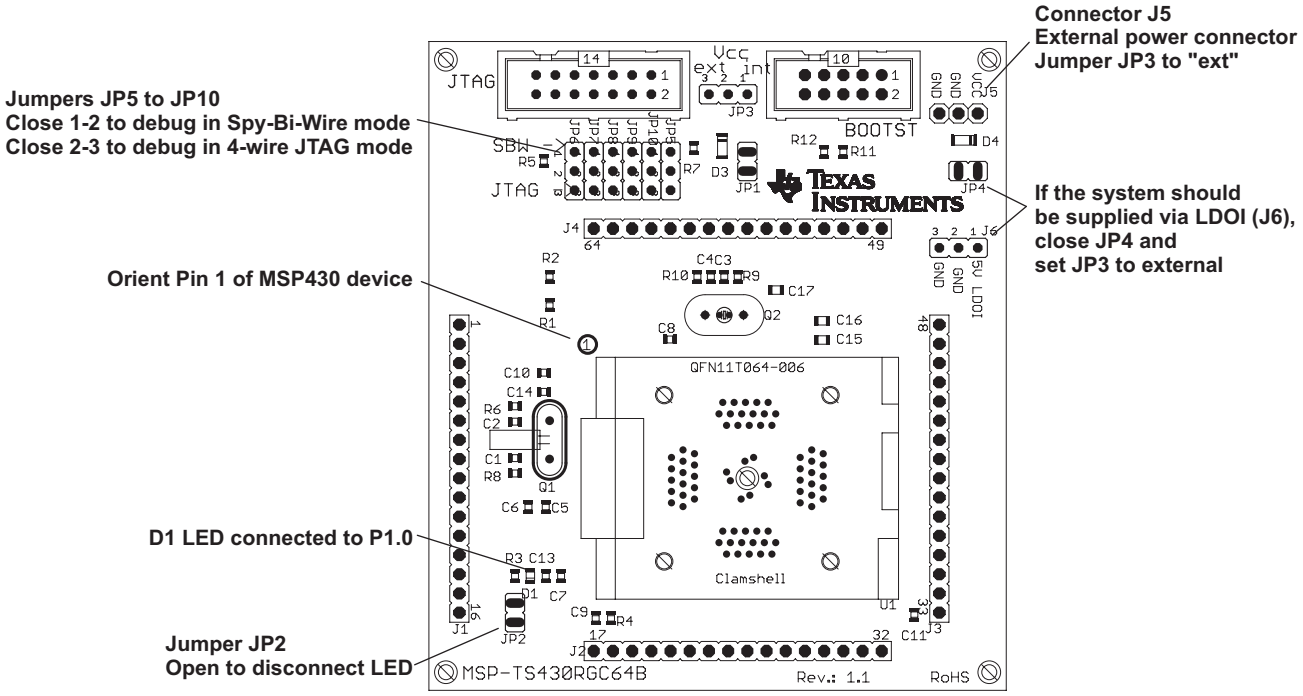

Figure B-36. MSP-TS430RGC64B Target Socket Module, PCB

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Table B-20. MSP-TS430RGC64B Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3, C4	0	47pF, SMD0805		DNP
3	C6, C7, C10	3	10uF, 6.3V, SMD0805		
4	C5, C11, C13, C14, C15	5	100nF, SMD0805	311-1245-2-ND	
5	C8	1	2.2nF, SMD0805		
6	C9	1	470nF, SMD0805	478-1403-2-ND	
7	C16	1	4.7uF, SMD0805		
8	C17	1	220nF, SMD0805		
9	D1	1	green LED, SMD0805	P516TR-ND	
10	J1, J2, J3, J4	0	16-pin header, TH	SAM1029-16-ND (Header) SAM1213-16-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
11	J5 , J6	2	3-pin header, male, TH		
12	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
13	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
14		10	Jumper	15-38-1024-ND	See Pos. 12 and Pos. 13
15	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
16	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
17	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
18	Q2	0	Crystal	Q2: 4MHz Buerklin: 78D134	DNP: Q2 Keep vias free of solder
19	Insulating disk to Q2	0	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
20	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
21	R1, R2, R4, R6, R8, R9,R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11,R12
22	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
23	U1	1	Socket: QFN11T064-006-N-HSP		Manuf.: Yamaichi
24	PCB	1	85 x 76 mm		2 layers
25	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
26	D3,D4				
27	MSP430	2	MSP430F5310 RGC		DNP: enclosed with kit, supplied by TI

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B.19 MSP-TS430RGC64C

The MSP-TS430RGC64C target board has been designed to operate with the target device DVIO input voltage supplied via header J6 (see Figure B-37). This development platform does not supply the 1.8-V DVIO rail on board and it MUST be provided by external power supply for proper device operation. For correct JTAG connection, programming, and debug operation, it is important to follow this procedure:

1. Make sure that the VCC and DVIO voltage supplies are OFF and that the power rails are fully discharged to 0 V.
2. Enable the 1.8-V external DVIO power supply.
3. Enable the 1.8-V to 3.6-V VCC power supply (alternatively, this supply can be provided from the MSP-FET430UIF JTAG debugger interface).
4. Connect the MSP-FET430UIF JTAG connector to the target board.
5. Start the debug session using IAR or CCS IDE.

For more information on debugging the MSP430F522x, see the device data sheet (SLAS718) and *Designing with MSP430F522x and MSP430F521x Devices* (SLAA558).

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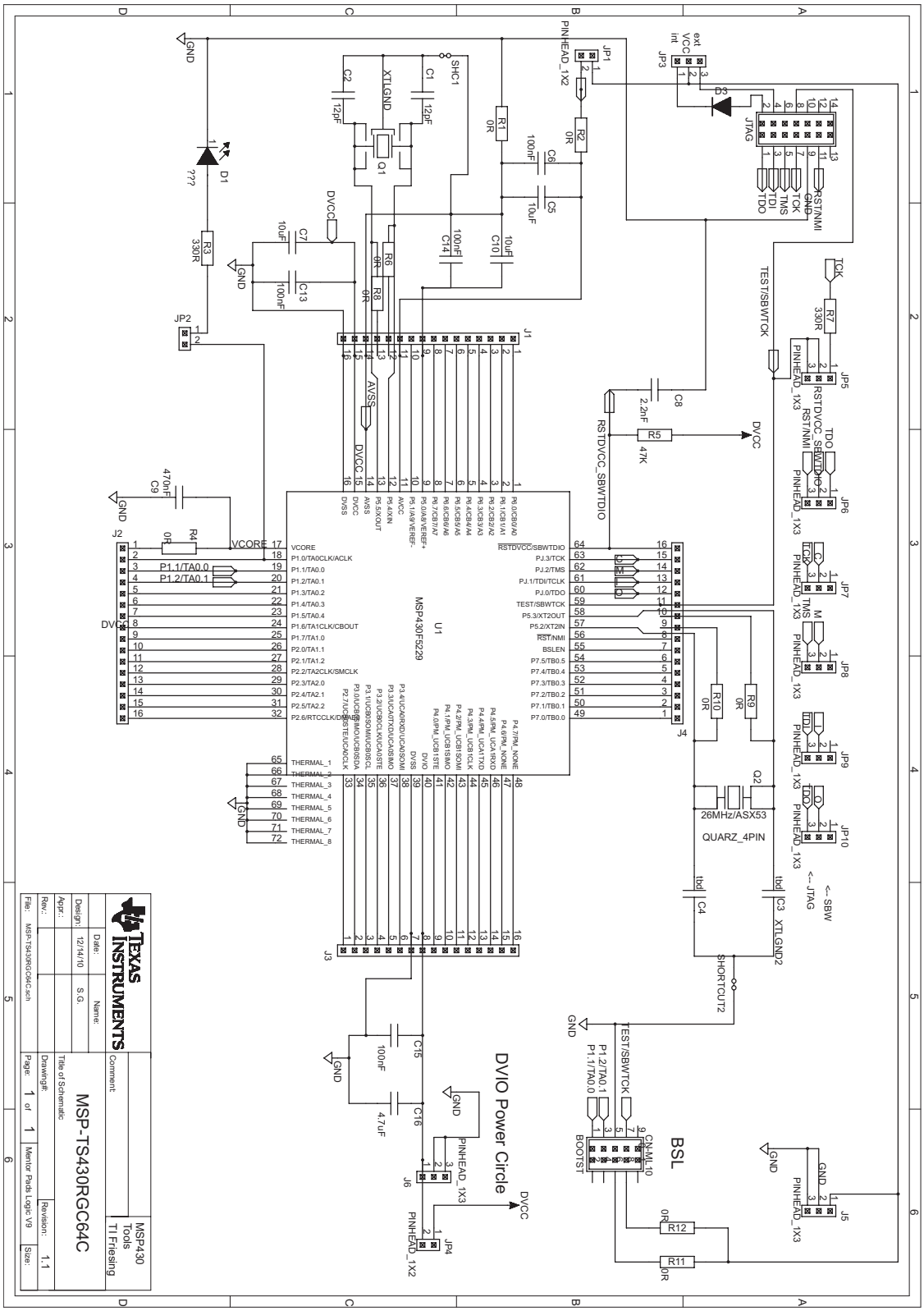

Figure B-37. MSP-TS430RGC64C Target Socket Module, Schematic

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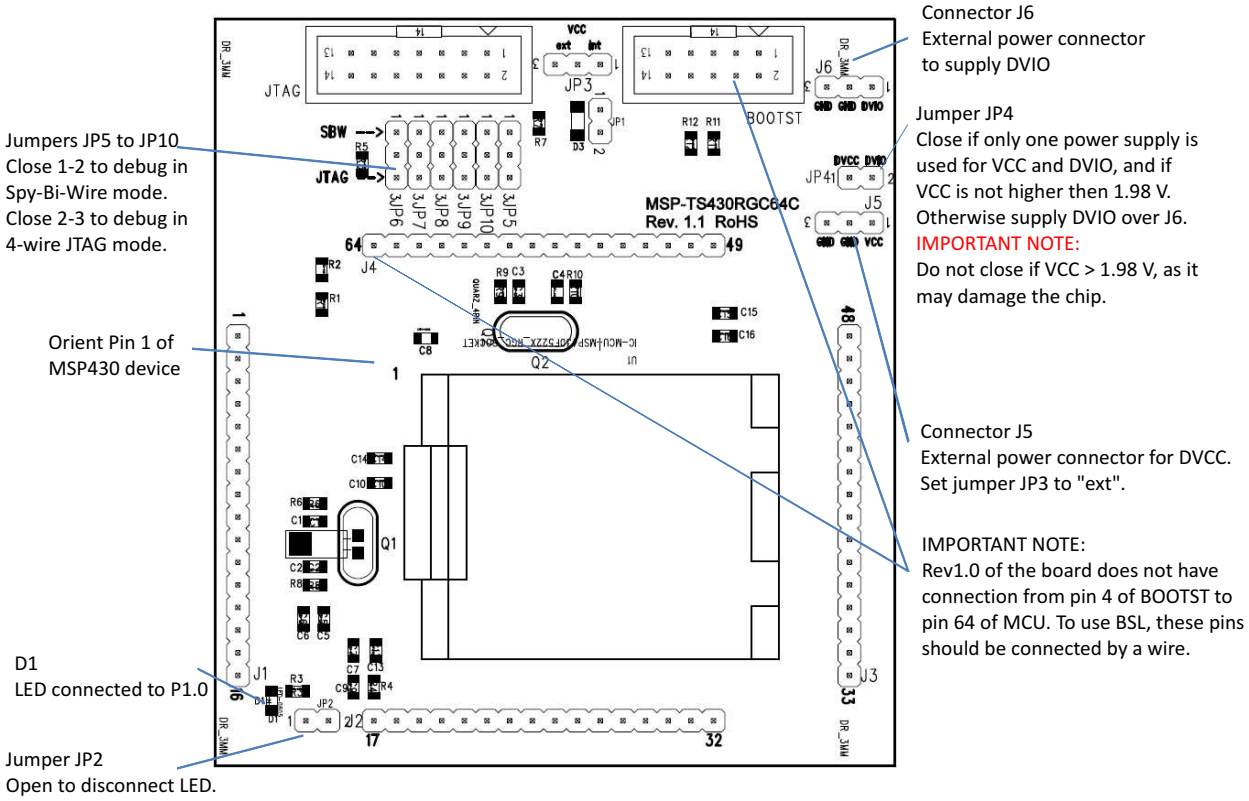

Figure B-38. MSP-TS430RGC64C Target Socket Module, PCB

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Table B-21. MSP-TS430RGC64C Bill of Materials

Item	Qty	Reference	Value	Description	Comment	Supplier No.
1	0	C1, C2	12pF	CAP, SMD, Ceramic, 0805	DNP C1 C2	
2	0	C3, C4	tbd	CAP, SMD, Ceramic, 0805	DNP C3 C4	
4	3	C5, C7, C10	10uF	CAP, SMD, Ceramic, 0805		
5	5	C8 C6 C13-15	100nF	CAP, SMD, Ceramic, 0805		DigiKey: 311-1245-2-ND
5	5	C8	2.2nF	CAP, SMD, Ceramic, 0805		
6	1	C9	470nF	CAP, SMD, Ceramic, 0805		DigiKey: 478-1403-2-ND
7	1	C16	4.7uF	CAP, SMD, Ceramic, 0805		
8	1	D1	Green LED	LED, SMD, 0805		
9	4	J1-J4	16-pin header	Pin header 1x16: Grid: 100mil (2.54 mm)	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle	 SAM1029-16-ND SAM1213-16-ND
10	2	J5, J6	3-pin header, male, TH	Pin header 1x3: Grid: 100mil (2.54 mm)		SAM1035-03-ND
11		JP5, JP6, JP7, JP8, JP9, JP10	3-pin header, male, TH	Pinheader 1x3: Grid: 100mil (2.54 mm)	place jumpers on pins 2-3	SAM1035-03-ND
12		JP3	3-pin header, male, TH	Pin header 1x3: Grid: 100mil (2.54 mm)	place jumper on pins 1-2	SAM1035-03-ND
13		JP1, JP2, JP4	2-pin header, male, TH	Pin header 1x2; Grid: 100mil (2.54 mm)	place jumper on header	SAM1035-02-ND
14	10		Jumper		Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10	15-38-1024-ND
15	1	JTAG	2x7Pin,Wanne	Header, THD, Male 2x7 Pin, Wanne, 100mil spacing		HRP14H-ND
16	0	BOOTST	2x5Pin,Wanne	Header, THD, Male 2x5 Pin, Wanne, 100mil spacing		DNP
17	1	Q1	26MHz/ASX53	CRYSTAL, SMD, 5x3MM, 26MHz		Only Kit.
18	0	Q2	26MHz/ASX53	CRYSTAL, SMD, 5x3MM, 26MHz		300-8219-1-ND
19	1	D3	LL103A	DIODE, SMD, SOD123, Schottky		Buerklin: 24S3406
20	2	R3, R7	330 Ohm, SMD0805			541-330ATR-ND
21	1	R5	47k Ohm, SMD0805	RES, SMD, 0805, 1/8W, x%		541-47000ATR-ND
22		R1, R2, R4, R6, R8, R9, R10, R11, R12	0 Ohm, SMD0805	RES, SMD, 0805, 1/8W, x%	DNP: R6, R8, R9, R10, R11,R12	541-000ATR-ND
23	1	U1		Socket: QFN11T064-006-N-HSP	Manuf.: Yamaichi	
24	2	MSP430	MSP430F5229IRGCR	IC, MCU, SMD, 9.15x9.15mm Thermal Pad with Socket		
25	4	Rubber stand off	Rubber stand off		apply to corners at bottom side	Buerklin: 20H1724
26	1	PCB	84 x 76 mm	84 x 76 mm		

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B.20 MSP-TS430RGC64USB

Due to the use of diodes in the power chain, the voltage on the MSP430F5xx device is approximately 0.3 V lower than is set by the debugging tool. Set the voltage in the IDE to 0.3 V higher than desired; for example, to run the MCU at 3.0 V, set it to 3.3 V.

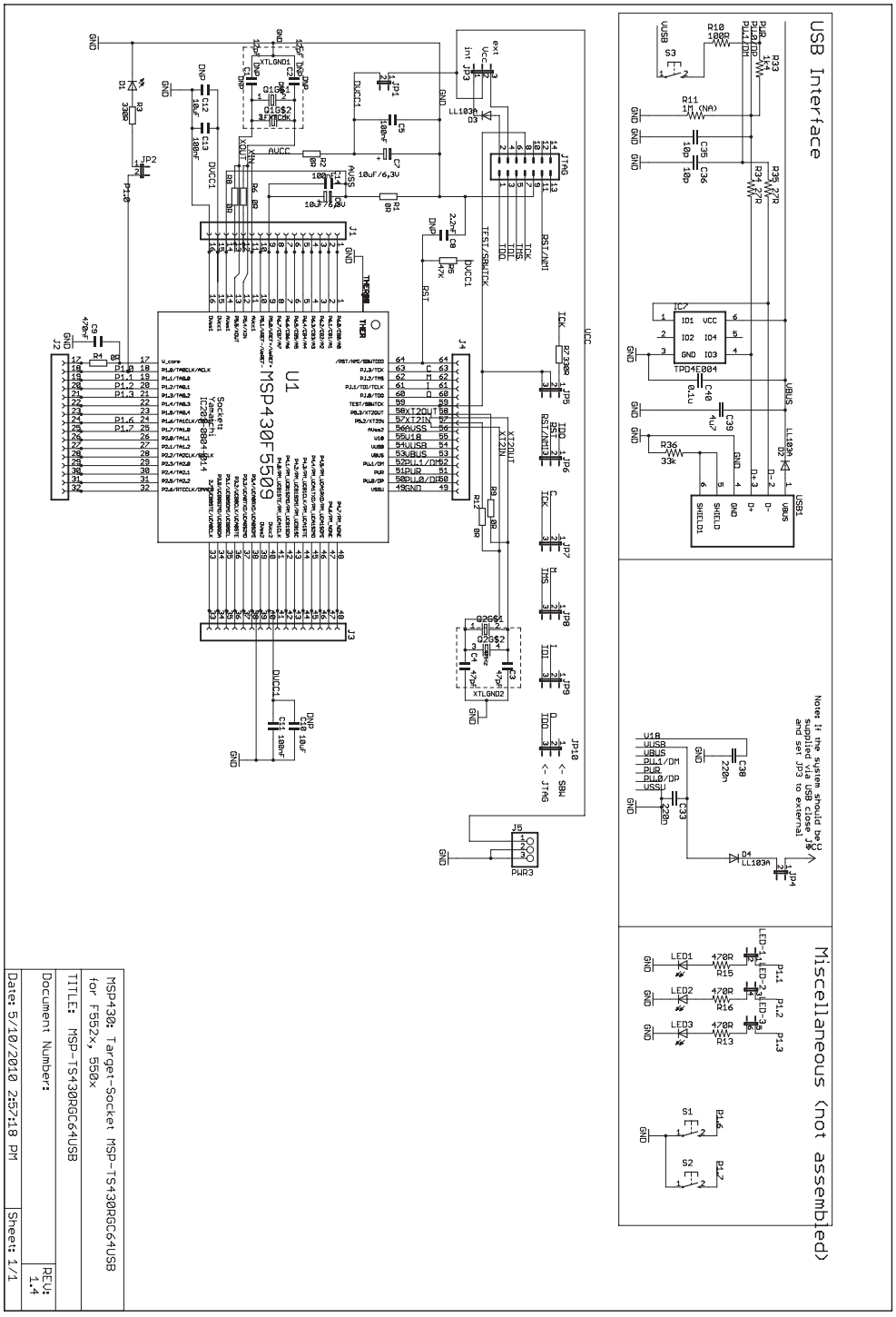

Figure B-39. MSP-TS430RGC64USB Target Socket Module, Schematic

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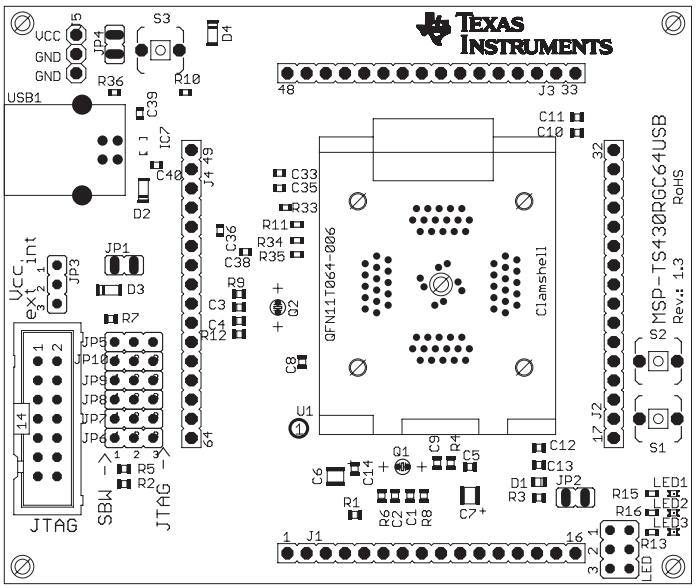

Figure B-40. MSP-TS430RGC64USB Target Socket Module, PCB

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Table B-22. MSP-TS430RGC64USB Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		
2	C6, C7	2	10uF, 6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14	4	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12	0	10uF, SMD0805		DNP: C10, C12
4	C8	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	16-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder.
				SAM1029-16-ND	: Header
				SAM1213-16-ND	: Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8, JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3
10	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	Q1	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder"
15	Q2	1	Crystal	Q2: 4MHz Buerklin: 78D134	
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R8, R9, R12
18	R10	1	100 Ω, SMD0805	Buerklin: 07E500	
18	R11	1	1M Ω, SMD0805		
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket: QFN11T064-006		Manuf.: Yamaichi
20	PCB	1	79 x 77 mm		2 layers
21	Rubber stand off	4		Buerklin: 20H1724	apply to corners at bottom side
22	MSP430	2	MSP430F5509 RGC		DNP: enclosed with kit. Is supplied by TI
23	Insulating disk to Q2	1	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
27	C33	1	220n SMD0603	Buerklin: 53D2074	
28	C35	1	10p SMD0603	Buerklin: 56D102	
29	C36	1	10p SMD0603	Buerklin: 56D102	
30	C38	1	220n SMD0603	Buerklin: 53D2074	
31	C39	1	4u7 SMD0603	Buerklin: 53D2086	
32	C40	1	0.1u SMD0603	Buerklin: 53D2068	
33	D2, D3, D4	3	LL103A	Buerklin: 24S3406	

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Table B-22. MSP-TS430RGC64USB Bill of Materials (continued)

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
34	IC7	1	TPD4E004		Manu: TI
36	LED	0	JP3QE	SAM1032-03-ND	DNP
37	LED1	0	LEDCHIPLED_0603	FARNELL: 852-9833	DNP
38	LED2	0	LEDCHIPLED_0603	FARNELL: 852-9868	DNP
39	LED3	0	LEDCHIPLED_0603	FARNELL: 852-9841	DNP
40	R13, R15, R16	0	470R	Buerklin: 07E564	DNP
41	R33	1	1k4 / 1k5	Buerklin: 07E612	
42	R34	1	27R	Buerklin: 07E444	
43	R35	1	27R	Buerklin: 07E444	
44	R36	1	33k	Buerklin: 07E740	
45	S1	0	PB	P12225STB-ND	DNP
46	S2	0	PB	P12225STB-ND	DNP
46	S3	1	PB	P12225STB-ND	
47	USB1	1	USB_RECEPTACLE	FARNELL: 117-7885	

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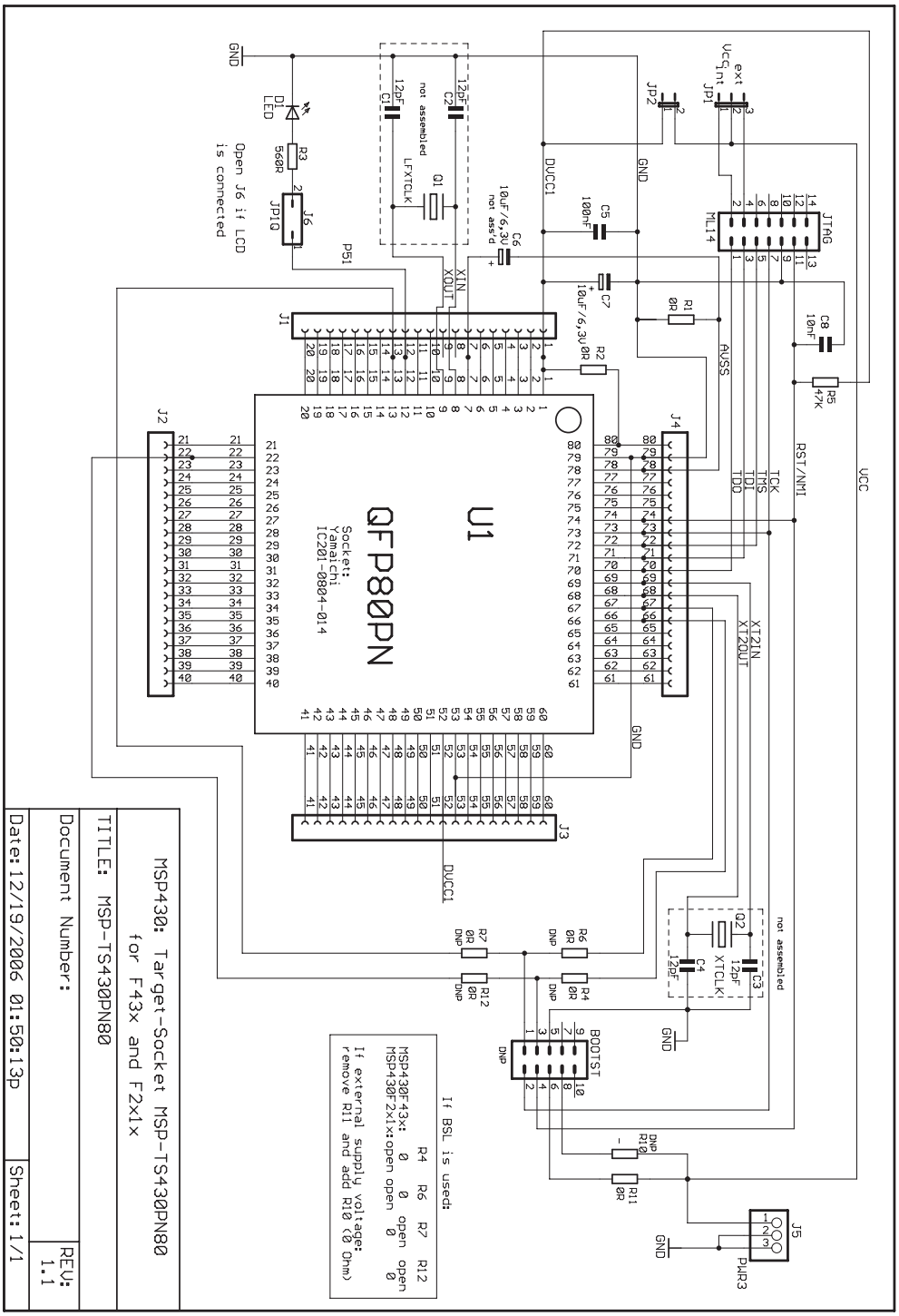
B.21 MSP-TS430PN80



NOTE: For MSP430F(G)47x devices:

Connect pins 7 and 10 (GND) externally to DV_{SS} (see data sheet).

Connect load capacitance on V_{ref} pin 60 when SD16 is used (see data sheet).

Figure B-41. MSP-TS430PN80 Target Socket Module, Schematic

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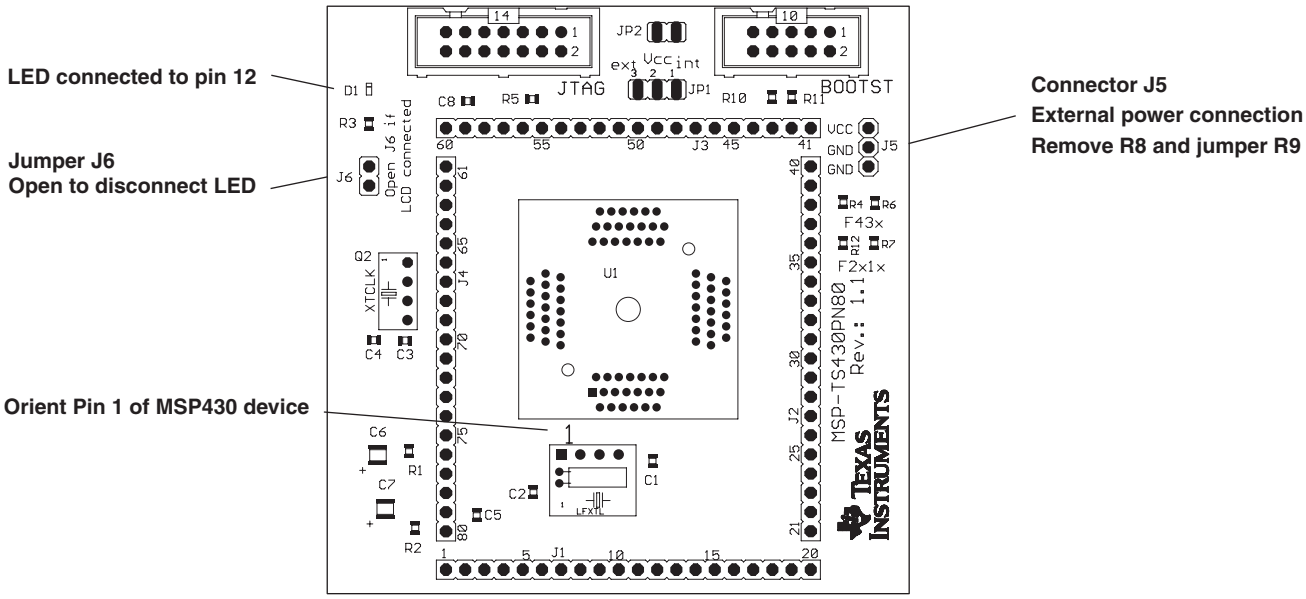

Figure B-42. MSP-TS430PN80 Target Socket Module, PCB

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Table B-23. MSP-TS430PN80 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	1	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-20-ND SAM1213-20-ND	DNP: Headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
7	J5, JP1	2	3-pin header, male, TH	SAM1035-03-ND	
8	J6, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		3	Jumper	15-38-1024-ND	Place on: J6, JP2, JP1/Pos1-2
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R3	1	560 Ω, SMD0805	541-560ATR-ND	
14	R1, R2, R4, R6, R7, R10, R11, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R7, R10, R11, R12
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC201-0804-014		Manuf.: Yamaichi
17	PCB	1	77 x 77 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430FG439IPN		DNP: Enclosed with kit supplied by TI

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B.22 MSP-TS430PN80A

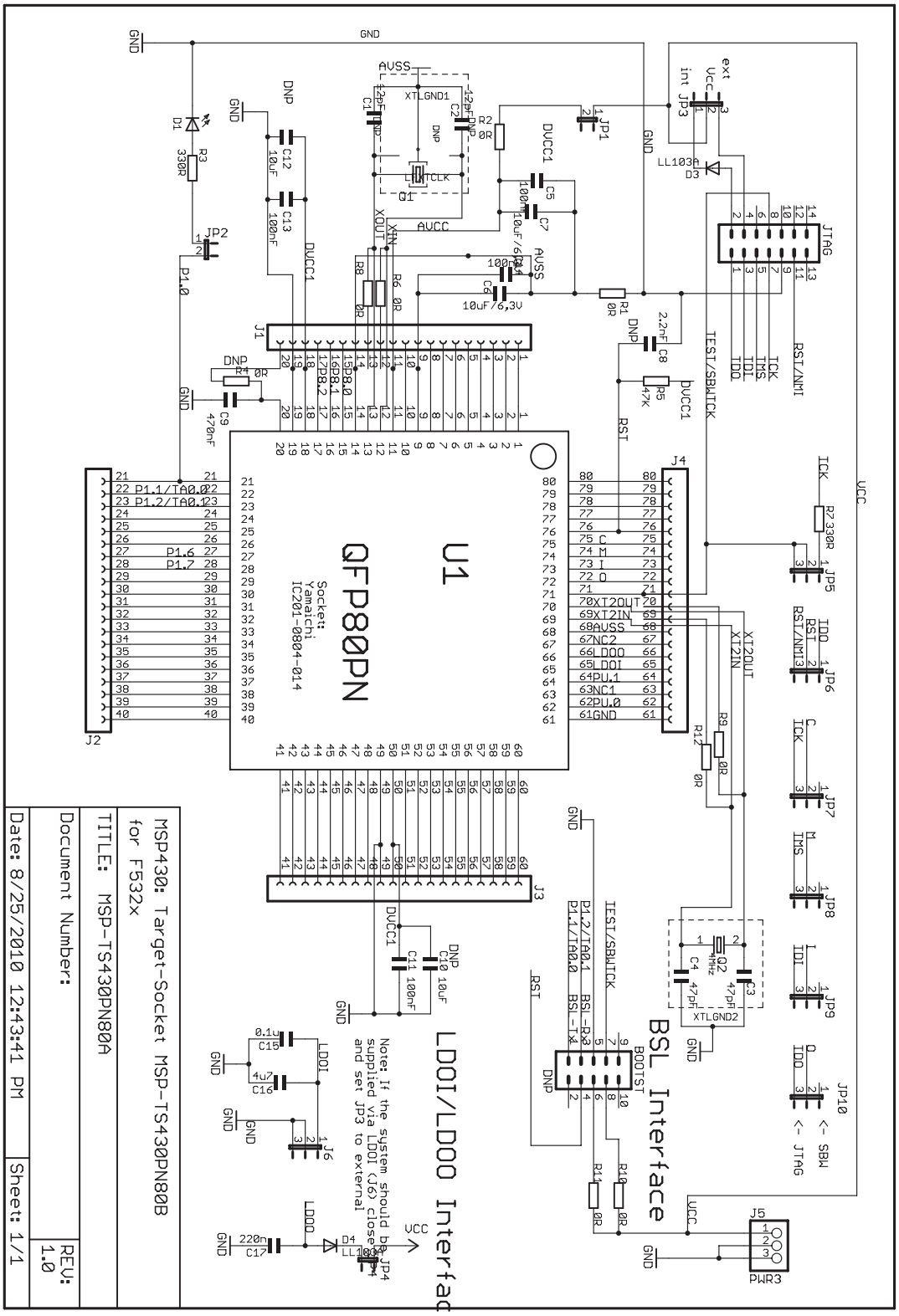

Figure B-43. MSP-TS430PN80A Target Socket Module, Schematic

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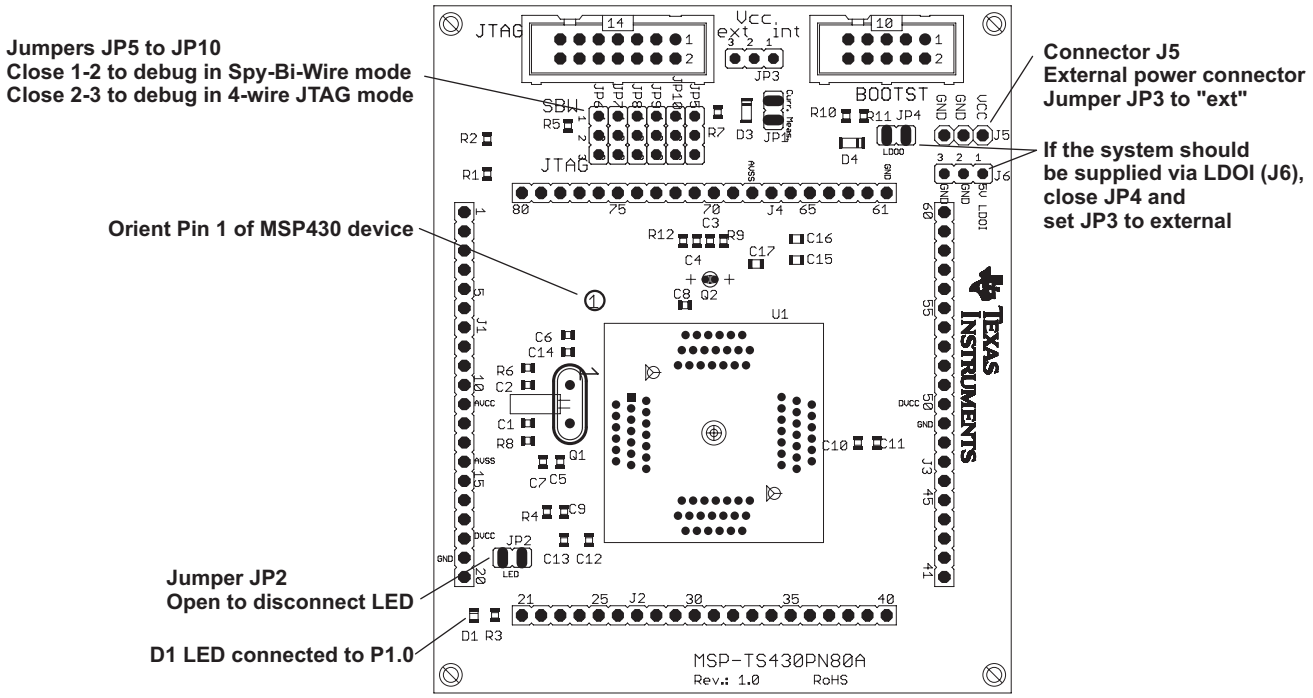

Figure B-44. MSP-TS430PN80A Target Socket Module, PCB

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Table B-24. MSP-TS430PN80A Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3, C4	0	47pF, SMD0805		DNP
3	C6, C7, C10, C12	3	10uF, 6.3V, SMD0805		DNP C10
4	C5, C11, C13, C14, C15	5	100nF, SMD0805	311-1245-2-ND	
5	C8	1	2.2nF, SMD0805		
6	C9	1	470nF, SMD0805	478-1403-2-ND	
7	C16	1	4.7uF, SMD0805		
8	C17	1	220nF, SMD0805		
9	D1	1	green LED, SMD0805	P516TR-ND	
10	J1, J2, J3, J4	0	20-pin header, TH	SAM1029-20-ND (Header) SAM1213-20-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
11	J5 , J6	2	3-pin header, male, TH		
12	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
13	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
14		10	Jumper	15-38-1024-ND	See Pos. 12 and Pos. 13
15	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
16	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
17	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
18	Q2	0	Crystal	Q2: 4MHz Buerklin: 78D134	DNP: Q2 Keep vias free of solder
19	Insulating disk to Q2	0	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
20	D3,D4	2	LL103A	Buerklin: 24S3406	
21	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
22	R1, R2, R4, R6, R8, R9,R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11,R12
23	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
24	U1	1	Socket:IC201-0804-014		Manuf.: Yamaichi
25	PCB	1	77 x 91 mm		2 layers
26	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
27	MSP430	2	MSP430F5329IPN		DNP: enclosed with kit, supplied by TI

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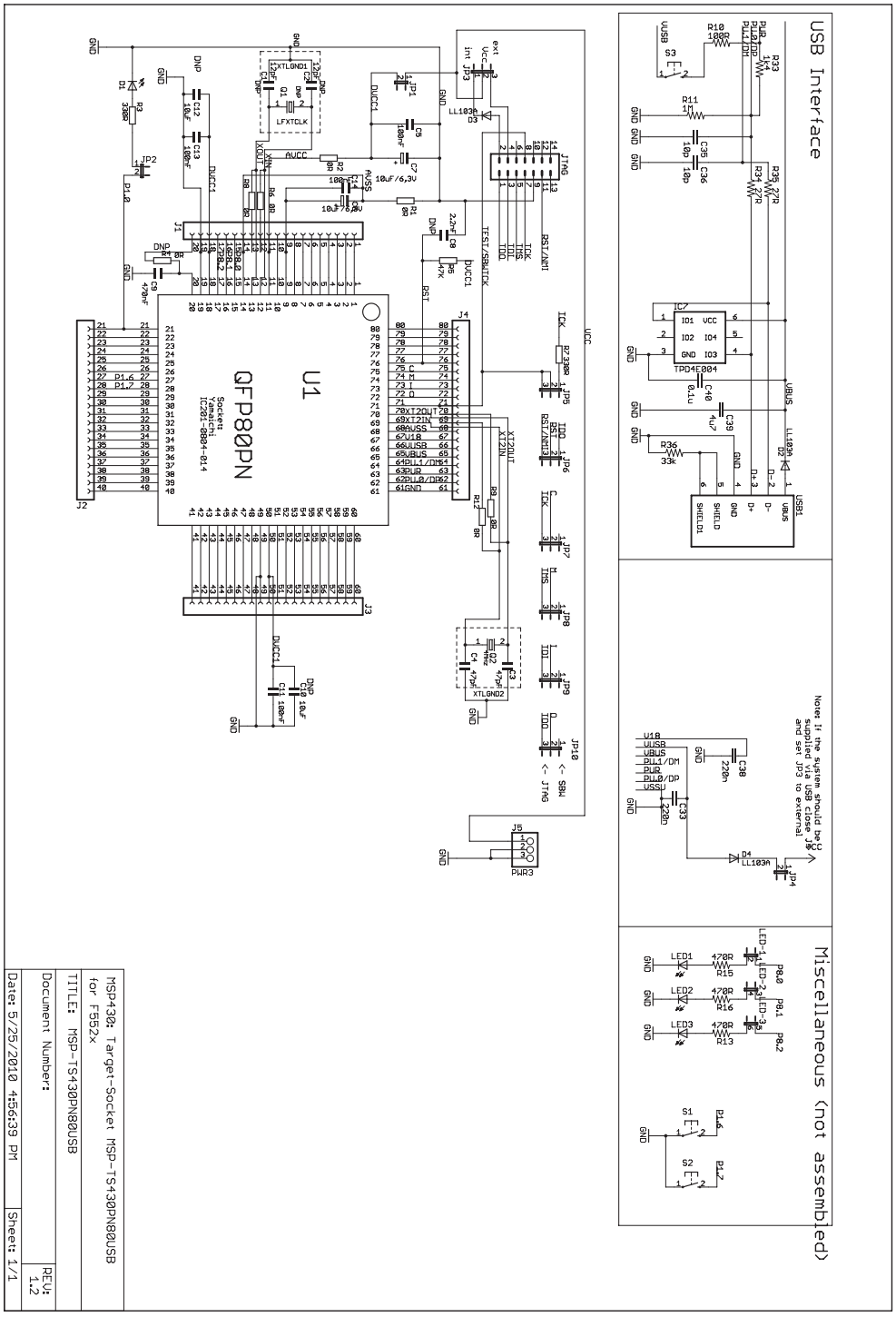
B.23 MSP-TS430PN80USB

Due to the use of diodes in the power chain, the voltage on the MSP430F5xx device is approximately 0.3 V lower than is set by the debugging tool. Set the voltage in the IDE to 0.3 V higher than desired; for example, to run the MCU at 3.0 V, set it to 3.3 V.



NOTE: R11 should be populated.

Figure B-45. MSP-TS430PN80USB Target Socket Module, Schematic

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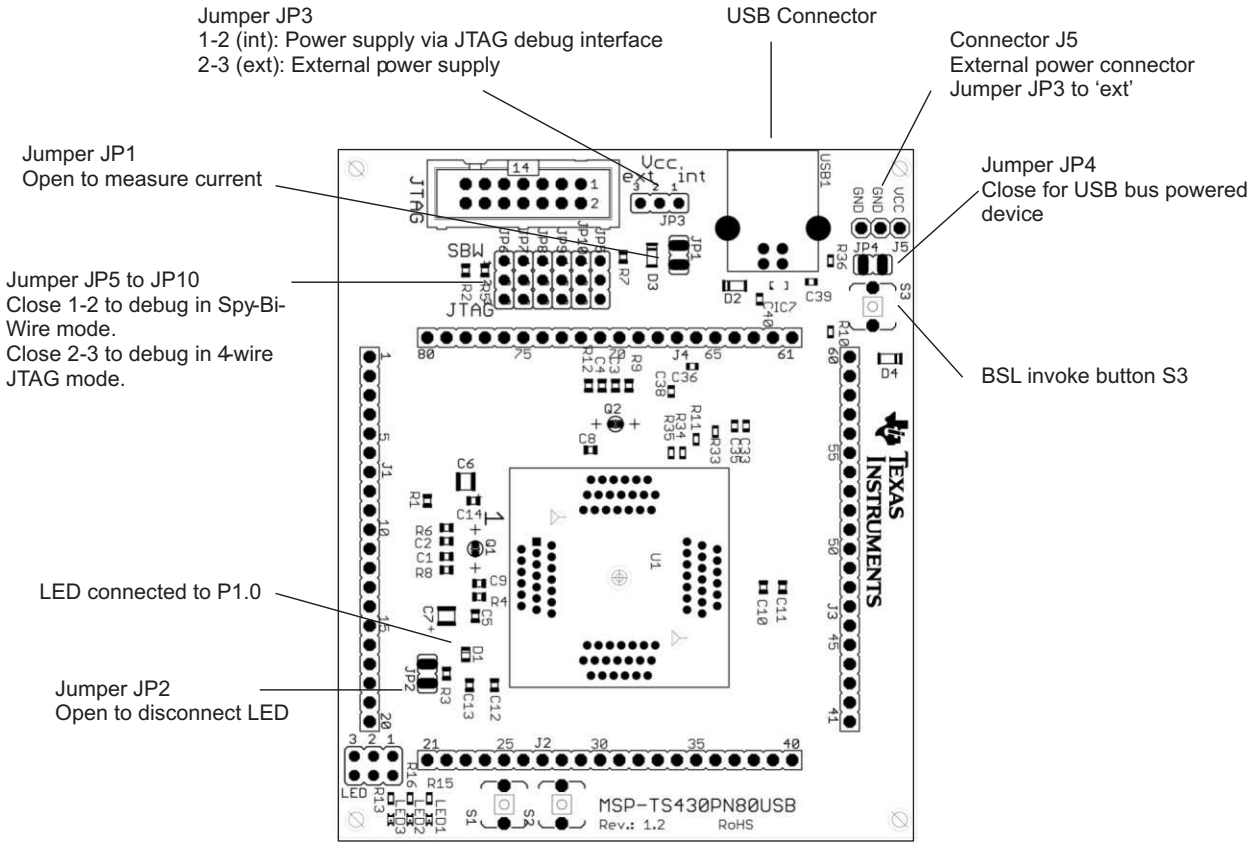

Figure B-46. MSP-TS430PN80USB Target Socket Module, PCB

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Table B-25. MSP-TS430PN80USB Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		
2	C6, C7	2	10uF, 6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14	4	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12	0	10uF, SMD0805	311-1245-2-ND	DNP: C10, C12
4	C8	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	20-pin header, TH	SAM1029-20-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.
7.1		4	20-pin header, TH	SAM1213-20-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8,JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 2-3
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
	JP4	1		SAM1035-02-ND	Place jumper only on one pin
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	Place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
15	Q2	1	Crystal	"Q2: 4MHzBuerklin: 78D134"	
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R8, R9, R12
18	R10	1	100 Ω, SMD0805	Buerklin: 07E500	
18	R11	0	1M Ω, SMD0805		DNP
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket:IC201-0804-014		Manuf.: Yamaichi
20	PCB	1	79 x 77 mm		2 layers
21	Rubber standoff	4		Buerklin: 20H1724	Apply to corners at bottom side
22	MSP430	2	MSP430F5529		DNP: Enclosed with kit supplied by TI
23	Insulating disk to Q2	1	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
27	C33	1	220n	Buerklin: 53D2074	

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Table B-25. MSP-TS430PN80USB Bill of Materials (continued)

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
28	C35	1	10p	Buerklin: 56D102	
29	C36	1	10p	Buerklin: 56D102	
30	C38	1	220n	Buerklin: 53D2074	
31	C39	1	4u7	Buerklin: 53D2086	
32	C40	1	0.1u	Buerklin: 53D2068	
33	D2, D3, D4	3	LL103A	Buerklin: 24S3406	
34	IC7	1	TPD4E004		Manu: TI
36	LED	0	JP3QE	SAM1032-03-ND	DNP
37	LED1	0	LEDCHIPLED_0603	FARNELL: 852-9833	DNP
38	LED2	0	LEDCHIPLED_0603	FARNELL: 852-9868	DNP
39	LED3	0	LEDCHIPLED_0603	FARNELL: 852-9841	DNP
40	R13, R15, R16	0	470R	Buerklin: 07E564	DNP
41	R33	1	1k4	Buerklin: 07E612	
42	R34	1	27R	Buerklin: 07E444	
43	R35	1	27R	Buerklin: 07E444	
44	R36	1	33k	Buerklin: 07E740	
45	S1	0	PB	P12225STB-ND	DNP
46	S2	0	PB	P12225STB-ND	DNP
46	S3	1	PB	P12225STB-ND	
47	USB1	1	USB_RECEPTACLE	FARNELL: 117-7885	

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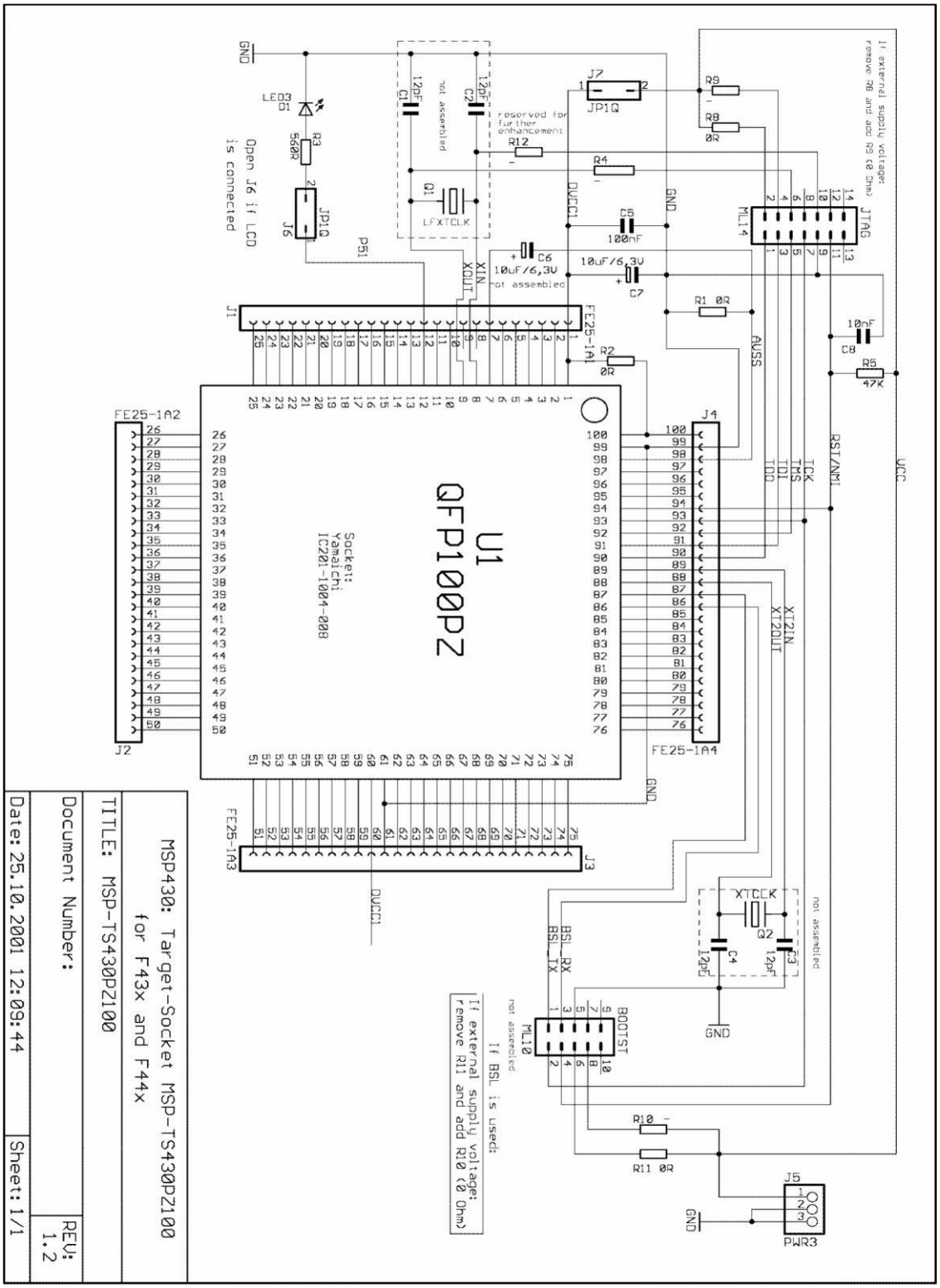
B.24 MSP-TS430PZ100



NOTE: Connections between the JTAG header and pins XOUT and XIN are no longer required and should not be made.

Figure B-47. MSP-TS430PZ100 Target Socket Module, Schematic

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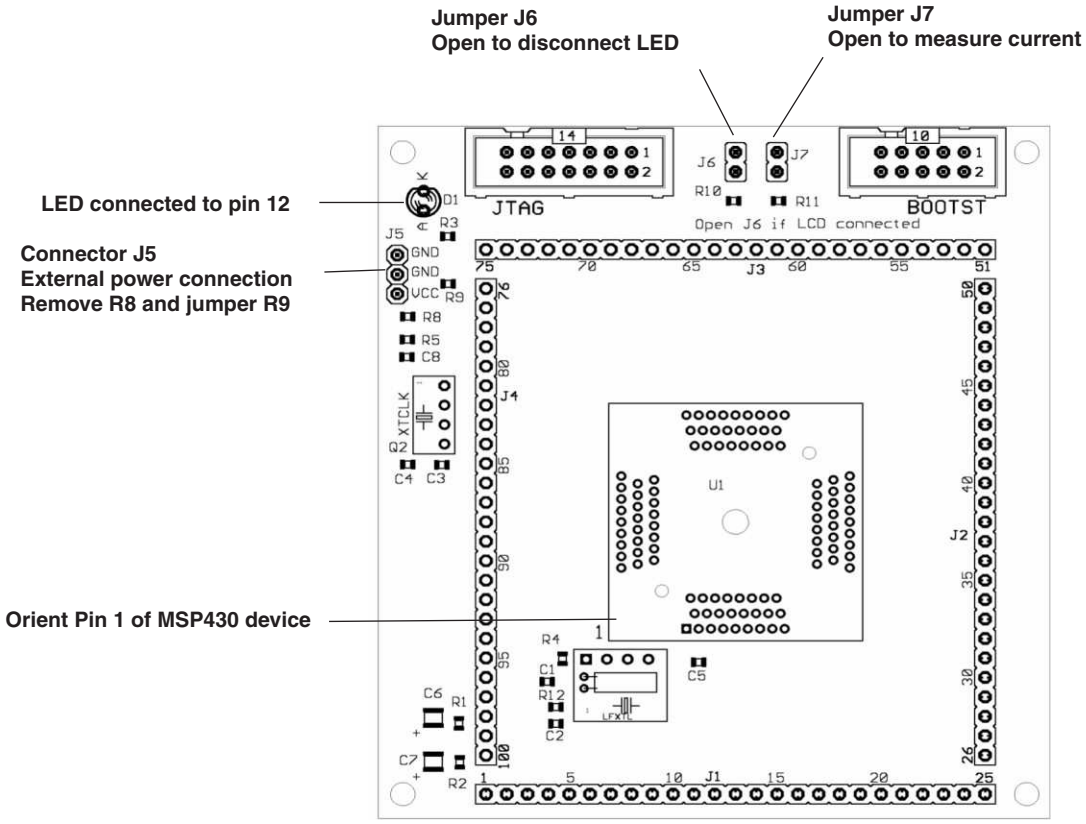

Figure B-48. MSP-TS430PZ100 Target Socket Module, PCB

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Table B-26. MSP-TS430PZ100 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1b	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	1	10uF, 10V, Tantal Size B	511-1463-2-ND	DNP: C6
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	yellow LED, TH, 3mm, T1	511-1251-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-ND SAM1213-25-ND	DNP: Headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	J6, J7	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10		2	Jumper	15-38-1024-ND	Place on: J6, J7
11	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
12	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
13	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
14	R3	1	330 Ω, SMD0805	541-330ATR-ND	
15	R1, R2, R4, R8, R9, R10, R11, R12	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R9, R10, R12
16	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
17	U1	1	Socket: IC201-1004-008 or IC357-1004-53N		Manuf.: Yamaichi
18	PCB	1	82 x 90 mm		2 layers
19	Adhesive Plastic feet	4	~6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
20	MSP430	2	MSP430FG4619IPZ		DNP: enclosed with kit supplied by TI

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B.25 MSP-TS430PZ100A

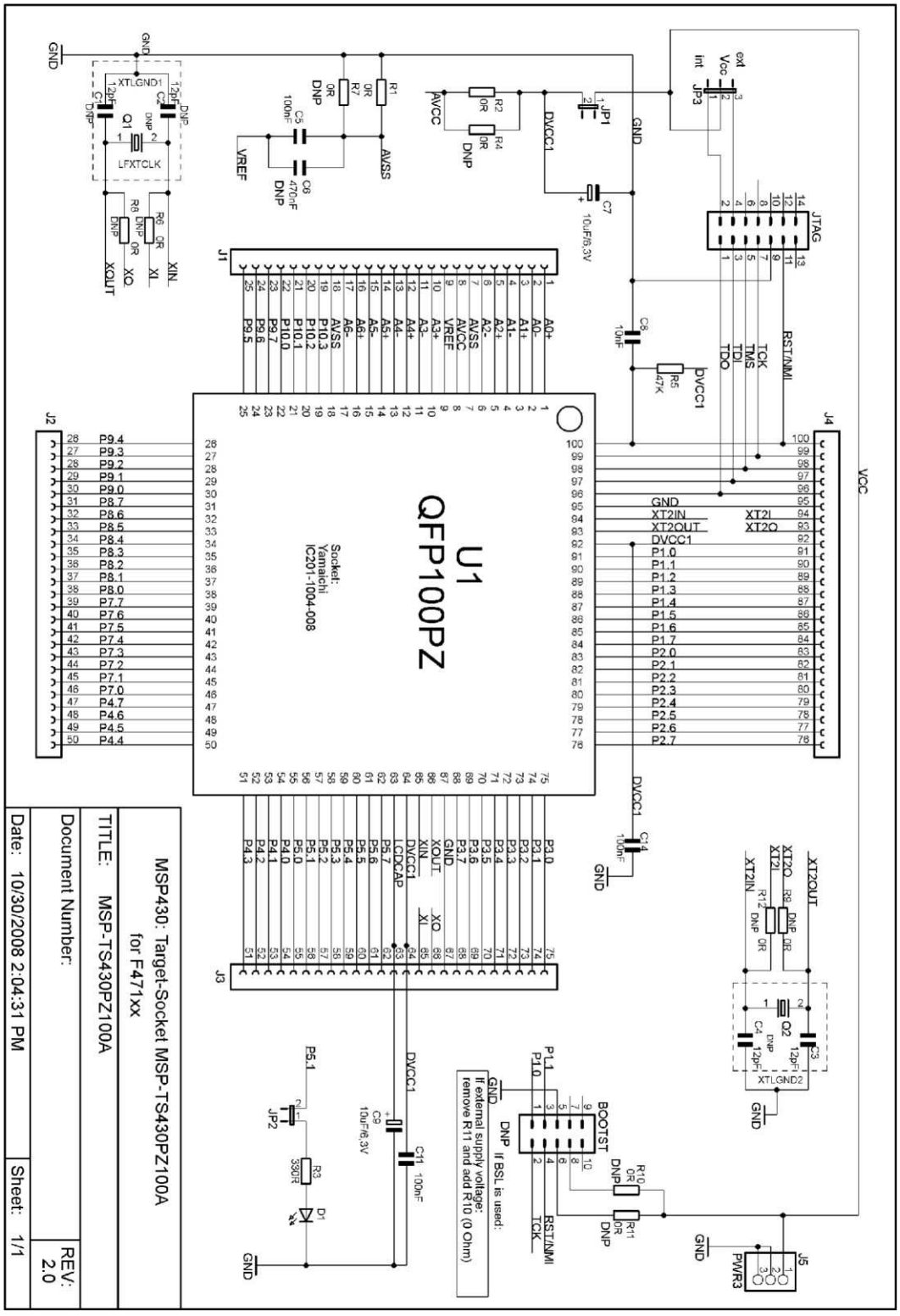

Figure B-49. MSP-TS430PZ100A Target Socket Module, Schematic

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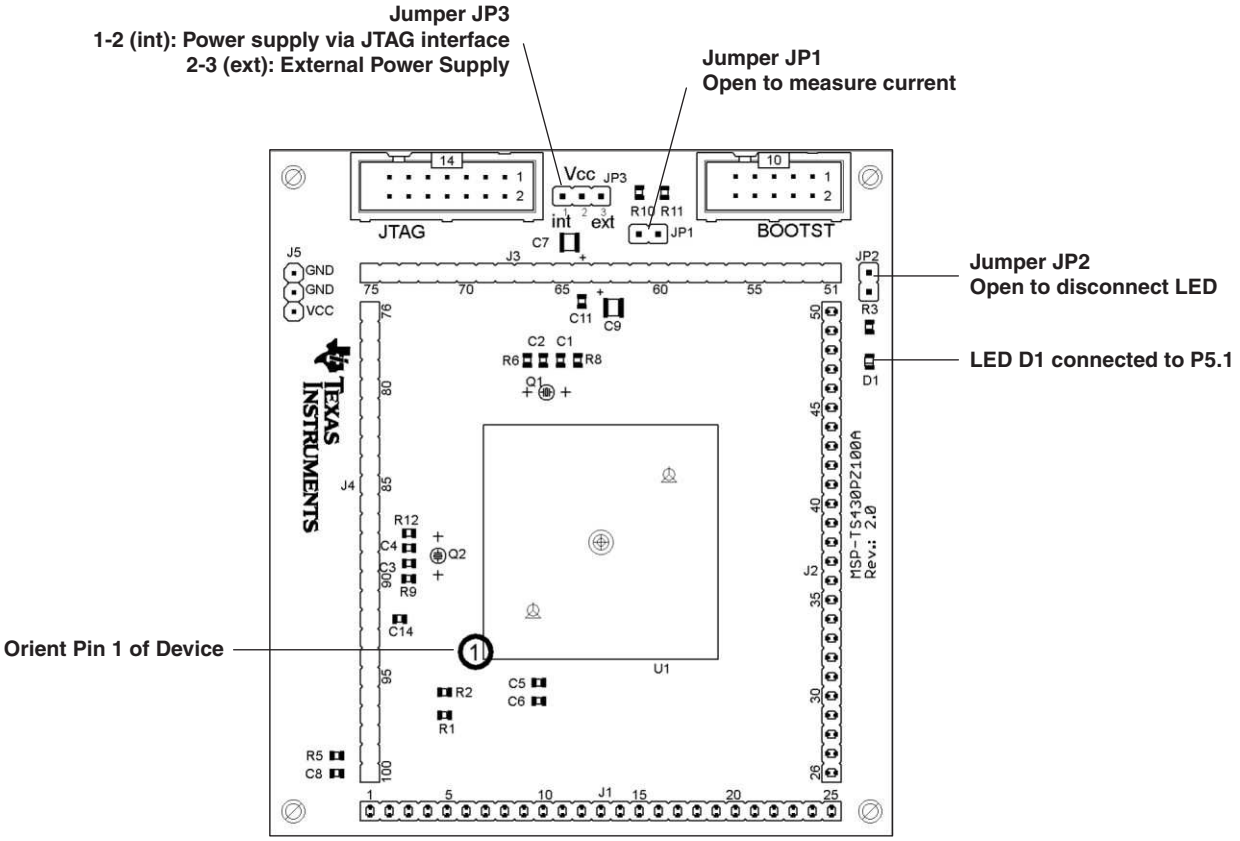

Figure B-50. MSP-TS430PZ100A Target Socket Module, PCB

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Table B-27. MSP-TS430PZ100A Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1b	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C7, C9	2	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C14	3	100nF, SMD0805	311-1245-2-ND	
4	C8	1	10nF, SMD0805	478-1358-1-ND	
5	C6	0	470nF, SMD0805	478-1403-2-ND	DNP
6	D1	1	green LED, SMD0805	67-1553-1-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-ND SAM1213-25-ND	DNP: Headers and receptacles enclosed with kit.Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	pPlace jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	Place jumper on pins 1-2
12		3	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
15	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
16	R3	1	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R7, R8, R9, R10, R11, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R7, R8, R9, R10, R11, R12
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
20	PCB	1	90 x 82 mm		4 layers
21	Rubber standoff	4		Select appropriate	Apply to corners at bottom side
22	MSP430	2	MSP430F5438IPZ		DNP: Enclosed with kit supplied by TI

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B.26 MSP-TS430PZ100B

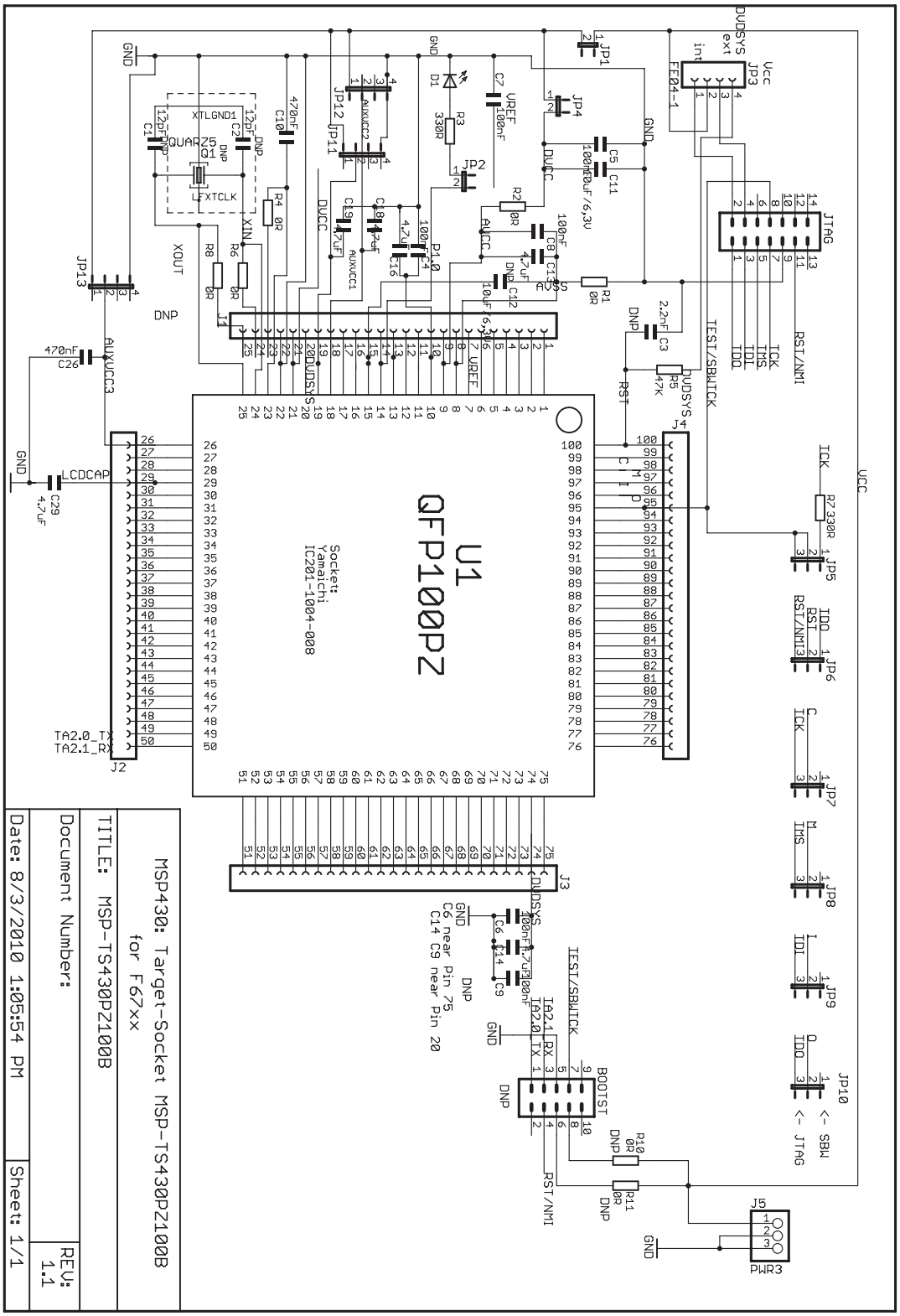

Figure B-51. MSP-TS430PZ100B Target Socket Module, Schematic

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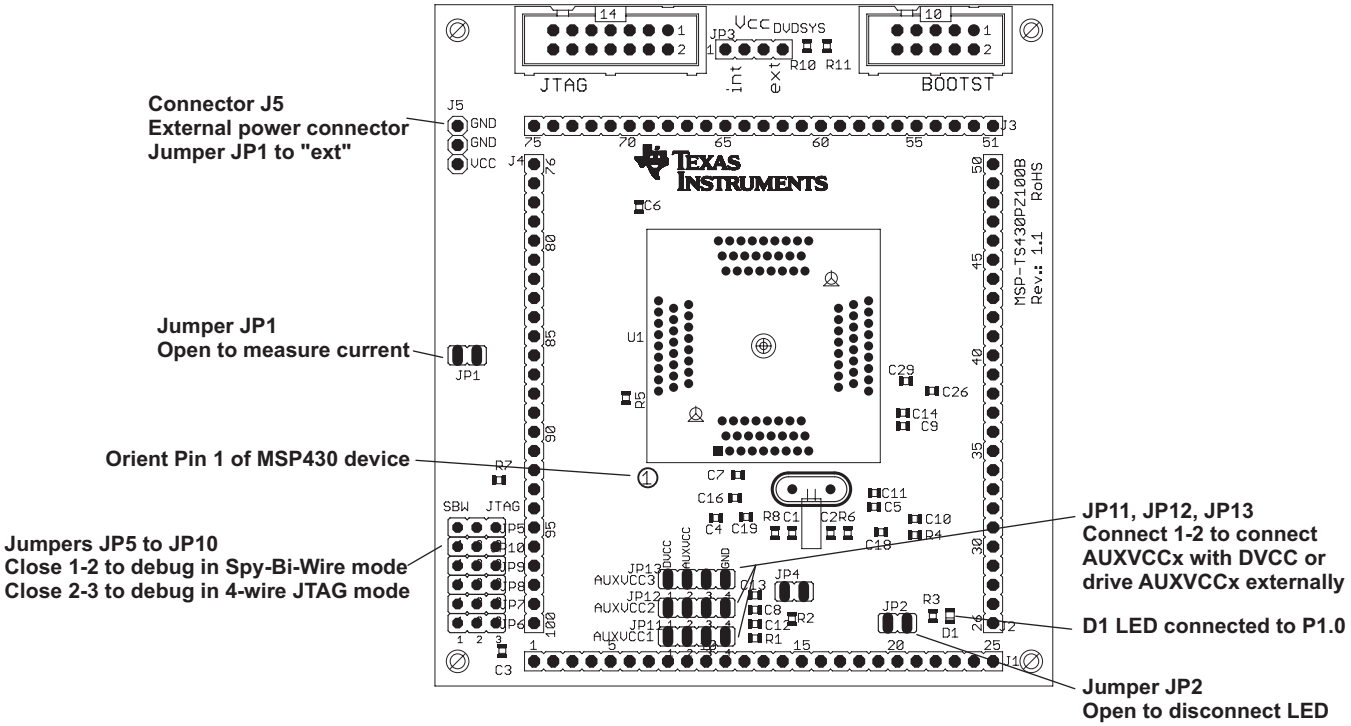

Figure B-52. MSP-TS430PZ100B Target Socket Module, PCB

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Table B-28. MSP-TS430PZ100B Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C4, C5, C6 , C7, C8, C9	6	100nF, SMD0805	311-1245-2-ND	
3	C10, C26	2	470 nF, SMD0805	478-1403-2-ND	
4	C11, C12	1	10 uF / 6.3 V SMD0805		C12 DNP
5	C13, C14, C16, C18, C19, C29	6	4.7 uF SMD0805		
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-ND (Header) SAM1213-25-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
8	J5	1	3-pin header, male, TH		
9	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
10	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11	JP11, JP12, JP13	3	4-pin header, male, TH		place jumper on header 1-2
12		13	Jumper	15-38-1024-ND	See Pos. 9 and Pos. 10 and Pos. 11
15	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
16	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
17	Q1	0	Crystal		DNP: Q1 Keep vias free of solder
21	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
22	R1, R2, R4, R6, R8, R10, R11	2	0 Ohm, SMD0805	541-000ATR-ND	DNP: R4, R6, R8, R10, R11
23	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
24	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
25	PCB	1	90 x 82 mm		2 layers
26	Adhesive plastic feet	4	Approximately 6mm width, 2mm height	for example, 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
27	MSP430	2	MSP430F6733IPZ		DNP: enclosed with kit, supplied by TI

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B.27 MSP-TS430PZ100C

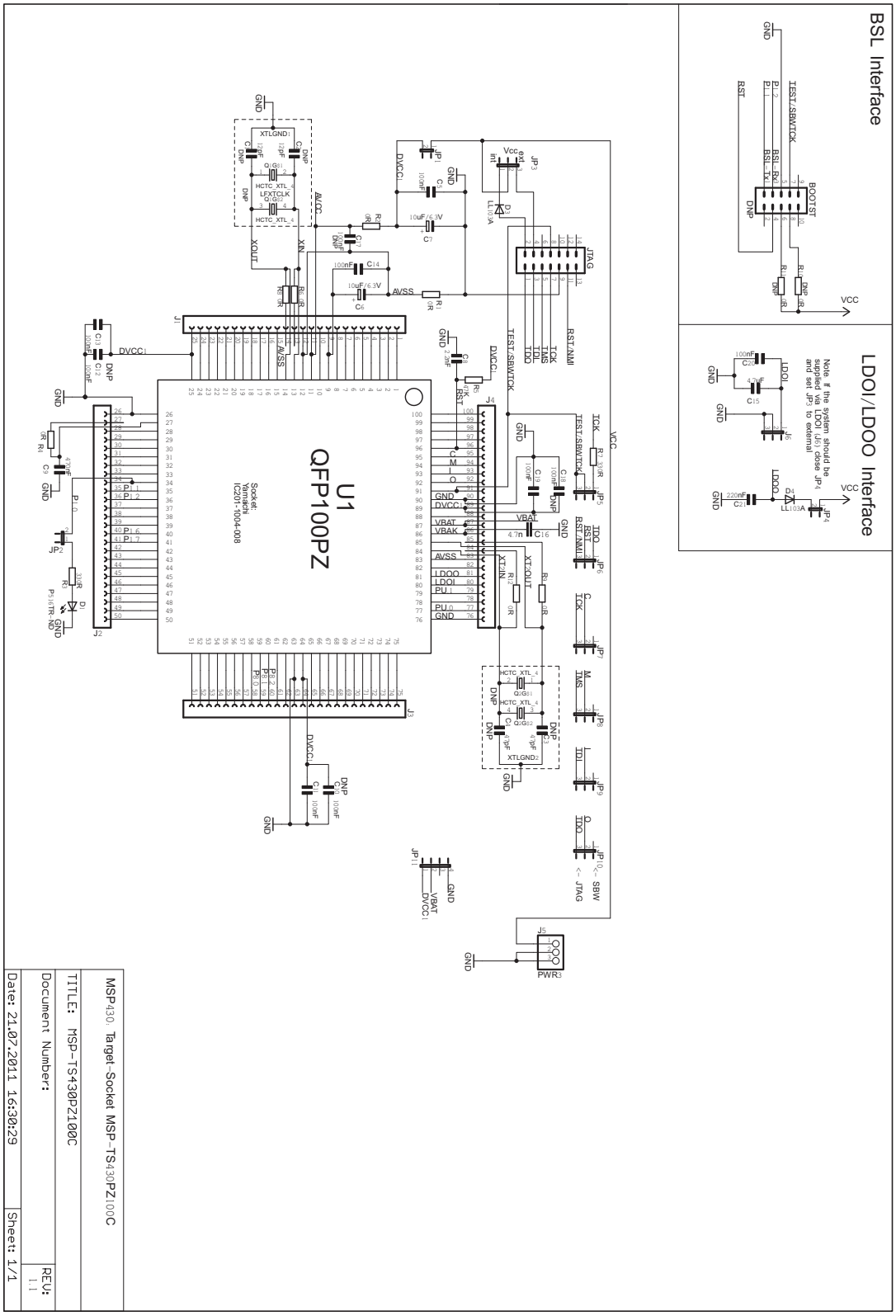

Figure B-53. MSP-TS430PZ100C Target Socket Module, Schematic

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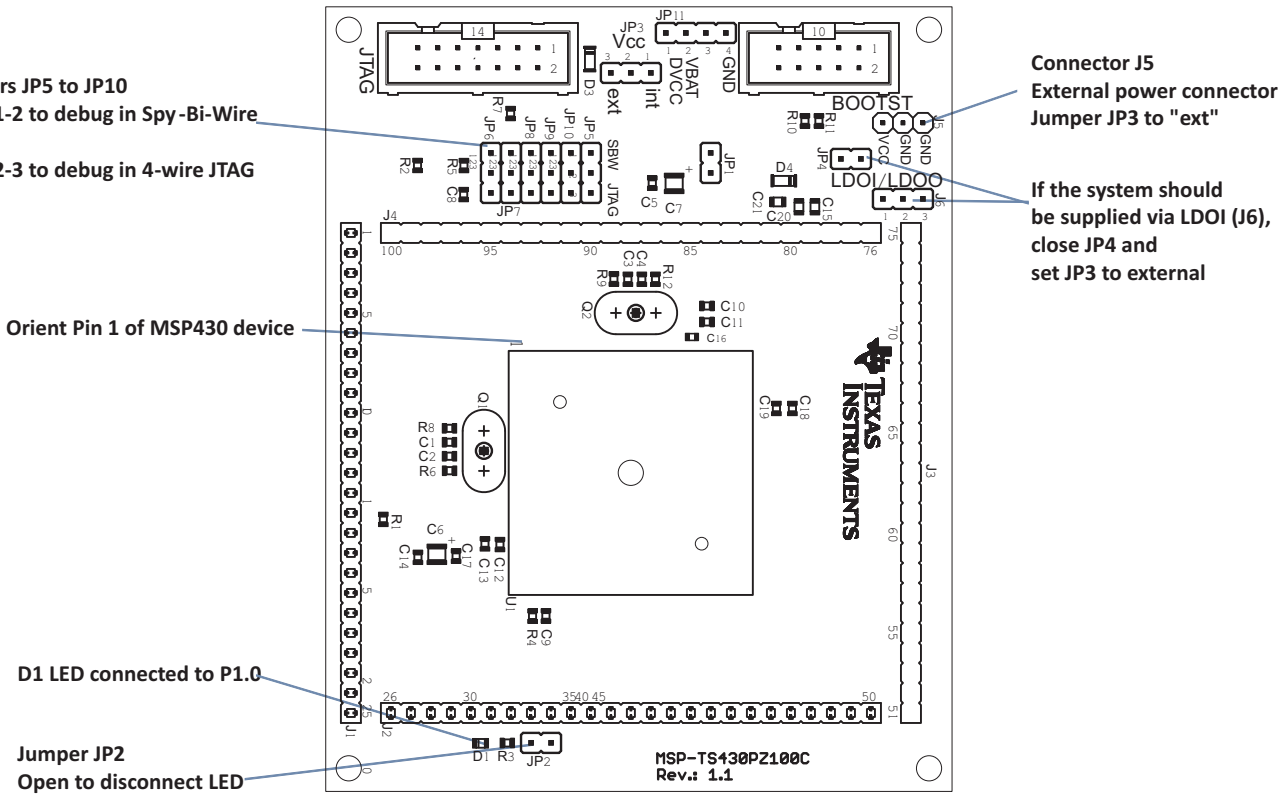

Figure B-54. MSP-TS430PZ100C Target Socket Module, PCB

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Table B-29. MSP-TS430PZ100C Bill of Materials

Pos.	Ref Des	Number Per Board	Description	Digi-Key Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		DNP: C3, C4
2	C6, C7	2	10uF, 6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14, C19, C20	6	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12, C18,17	0	100nF, SMD0805	311-1245-2-ND	DNP: C10, C12,C18, C17
4	C8	1	2.2nF, SMD0805	Buerklin 53 D 292	
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	25-pin header, TH	SAM1029-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.
7.1		4	25-pin header, TH	SAM1213-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.
8	J5, J6	2	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8,JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10.1	JP4	1	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	1	10-pin connector, male, TH	HRP10H-ND	DNP, keep vias free of solder
15	Q1	0	Crystal		DNP: Q1 Keep vias free of solder
16	Q2	1	Crystal		DNP: Q2 Keep vias free of solder
17	R3, R7	2	330 Ohm, SMD0805	541-330ATR-ND	
18	R1, R2, R4, R6, R8, R9, R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11, R12
19	R5	1	47k Ohm, SMD0805	541-47000ATR-ND	
20	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
21	PCB	1	79.5 x 99.5 mm	MSP-TS430PZ100C Rev 1.0	2 layers
22	Rubber stand off	4		Buerklin: 20H1724	apply to corners at bottom side
23	MSP430	2	MSP430F643x		DNP: enclosed with kit. Is supplied by TI.
24	C16	1	4.7 nF SMD0603	Buerklin 53 D 2042	
26	D3, D4	2	LL103A	Buerklin: 24S3406	
27	JP11	1	4-pin header, male, TH	SAM1035-04-ND	Place jumper on Pin 1 and Pin 2
28	C15	1	4.7 uF, SMD0805	Buerklin 53 D 2430	
29	C21	1	220nF, SMD0805	Buerklin 53 D 2381	

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B.28 MSP-TS430PZ5x100

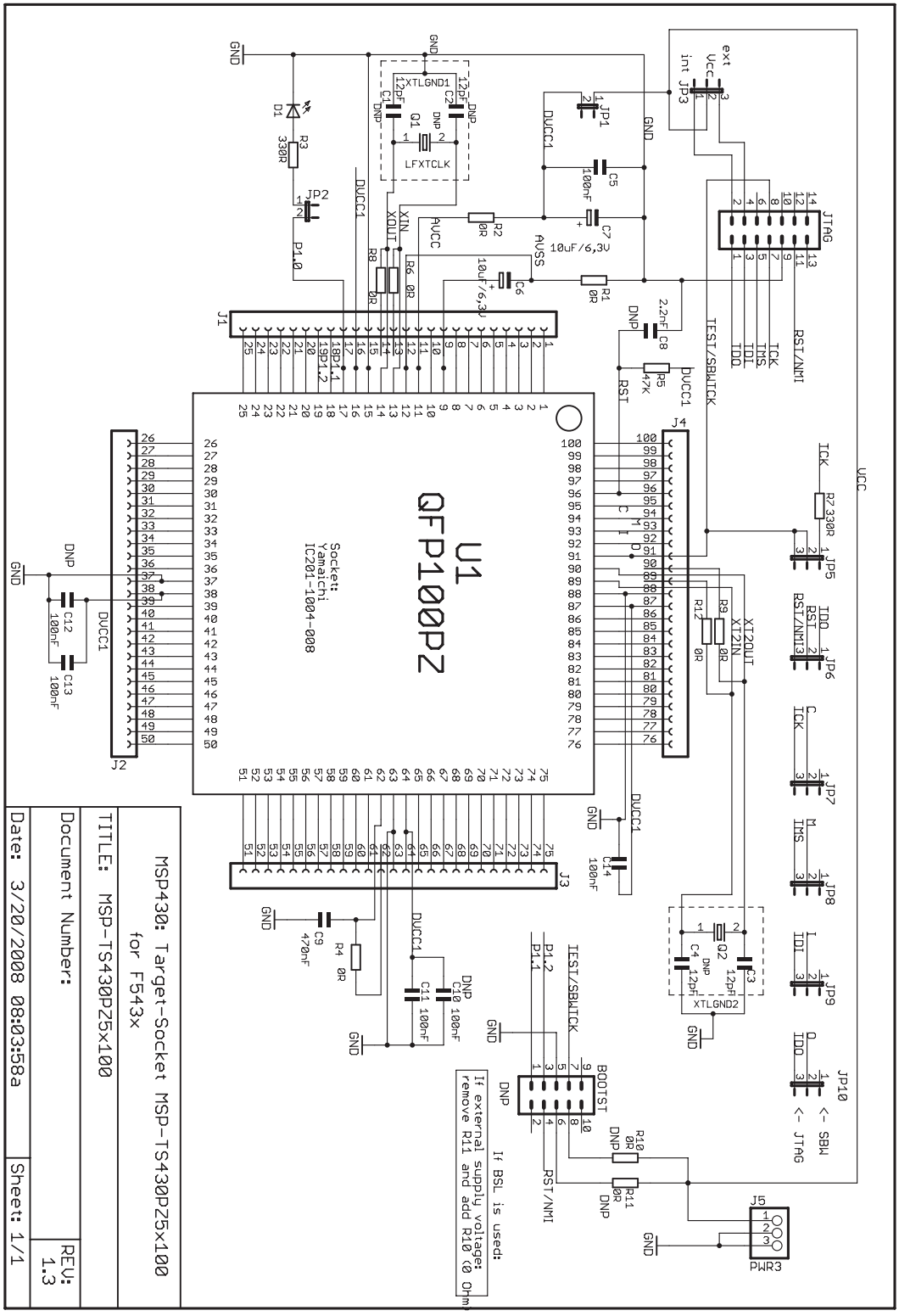

Figure B-55. MSP-TS430PZ5x100 Target Socket Module, Schematic

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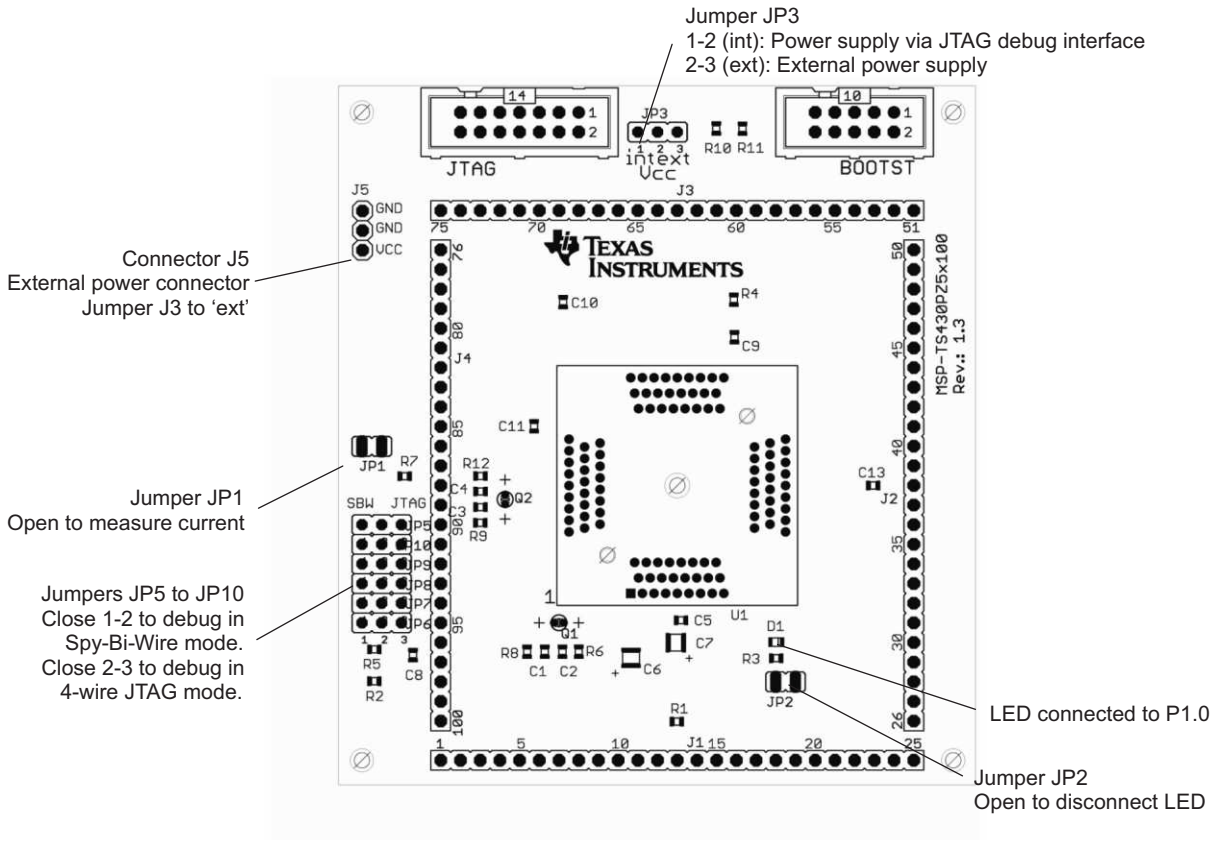

Figure B-56. MSP-TS430PZ5x100 Target Socket Module, PCB

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Table B-30. MSP-TS430PZ5x100 Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1b	C3, C4		47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	2	10uF, 10V, Tantal Size B	511-1463-2-ND	
3	C5, C10, C11, C12, C13, C14	4	100nF, SMD0805	311-1245-2-ND	DNP: C12, C14
4	C8	0	2.2nF, SMD0805		DNP
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	67-1553-1-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-ND SAM1213-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8, JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 2-3
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	Place jumper on pins 1-2
12		9	Jumper	15-38-1024-ND	Place on JP1, JP2, JP3, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
15	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R10, R11, R12	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11, R12
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
20	PCB	1	90 x 82 mm		2 layers
21	Rubber standoff	4		Select appropriate	Apply to corners at bottom side
22	MSP430	2	MSP430F5438IPZ		DNP: Enclosed with kit supplied by TI

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B.29 MSP-TS430PZ100USB

Due to the use of diodes in the power chain, the voltage on the MSP430F5xx device is approximately 0.3 V lower than is set by the debugging tool. Set the voltage in the IDE to 0.3 V higher than desired; for example, to run the MCU at 3.0 V, set it to 3.3 V.

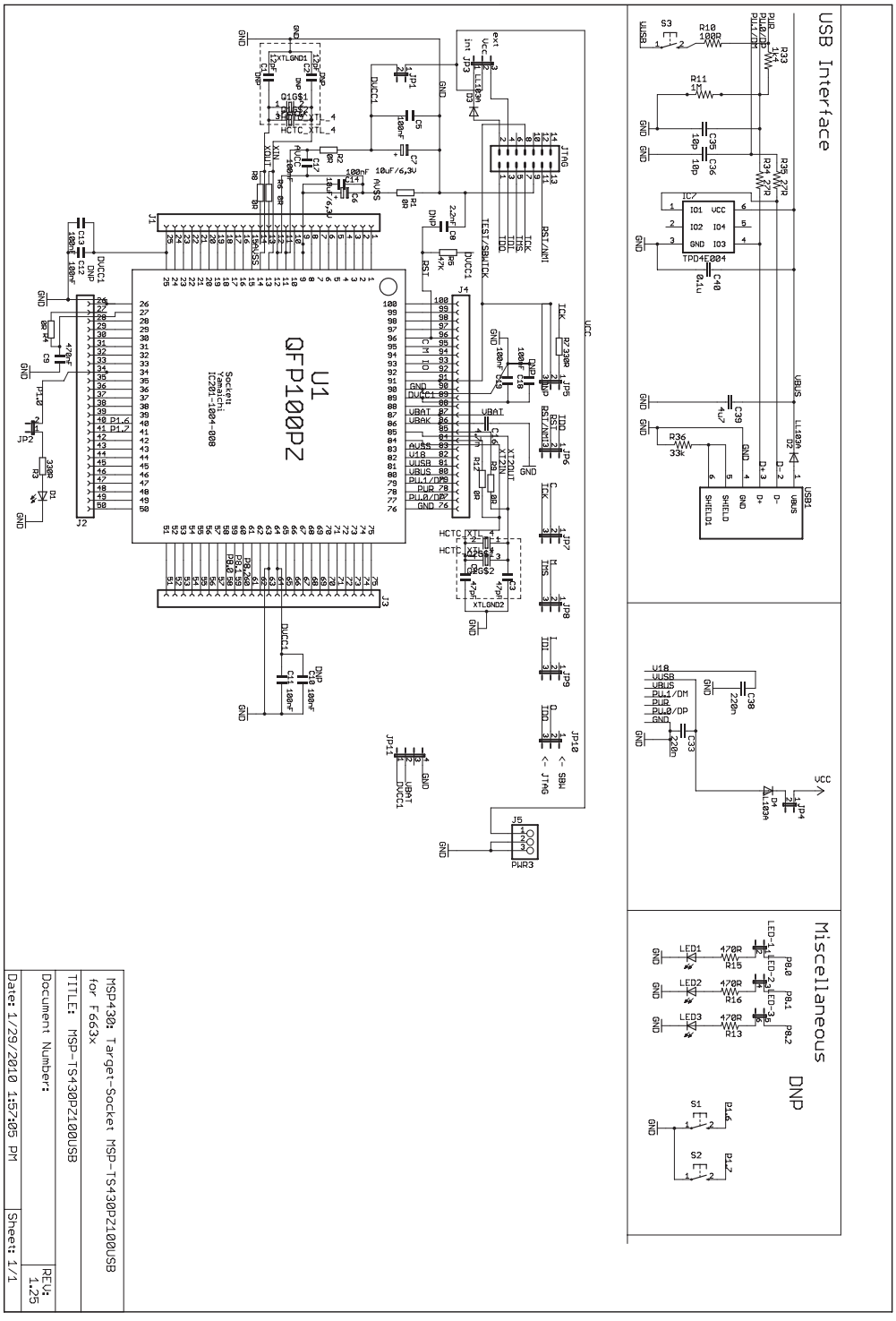

Figure B-57. MSP-TS430PZ100USB Target Socket Module, Schematic

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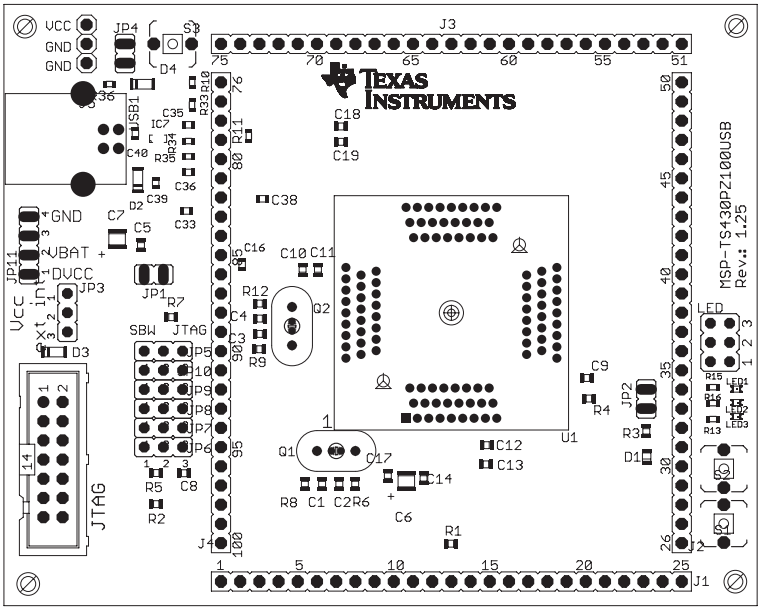

Figure B-58. MSP-TS430PZ100USB Target Socket Module, PCB

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Table B-31. MSP-TS430PZ100USB Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		
2	C6, C7	2	10uF, 6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14, C19	5	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12, C18, C17	0	100nF, SMD0805	311-1245-2-ND	DNP: C10, C12,C18, C17
4	C8	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	25-pin header, TH	SAM1029-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		4	25-pin header, TH	SAM1213-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8, JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3
10	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Q1. Keep vias free of solder
15	Q2	1	Crystal	Q2: 4MHz, Buerklin: 78D134	
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R12	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R12
18	R10	1	100 Ω, SMD0805	Buerklin: 07E500	
18	R11	1	1M Ω, SMD0603		not existing in Rev 1.0
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket:IC201-1004-008		Manuf.: Yamaichi
20	PCB	1	79 x 77 mm		2 layers
21	Rubber stand off	4		Buerklin: 20H1724	apply to corners at bottom side
22	MSP430	2	MSP430F5529		DNP: enclosed with kit. Is supplied by TI
23	Insulating disk to Q2	1	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
24	C16	1	4.7 nF SMD0603		
27	C33	1	220n SMD0603	Buerklin: 53D2074	
28	C35, C36	2	10p SMD0603	Buerklin: 56D102	

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Table B-31. MSP-TS430PZ100USB Bill of Materials (continued)

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
30	C38	1	220n SMD0603	Buerklin: 53D2074	
31	C39	1	4u7 SMD0603	Buerklin: 53D2086	
32	C40	1	0.1u SMD0603	Buerklin: 53D2068	
33	D2, D3, D4	3	LL103A	Buerklin: 24S3406	
34	IC7	1	TPD4E004		Manu: TI
35	LED	0	JP3QE	SAM1032-03-ND	DNP
36	LED1, LED2, LED3	0	LEDCHIPLED_0603	FARNELL: 852-9833	DNP
37	R13, R15, R16	0	470R SMD0603	Buerklin: 07E564	DNP
38	R33	1	1k4 / 1k5 SMD0603	Buerklin: 07E612	
39	R34	1	27R SMD0603	Buerklin: 07E444	
40	R35	1	27R SMD0603	Buerklin: 07E444	
41	R36	1	33k SMD0603	Buerklin: 07E740	
42	S1, S2, S3	1	PB	P12225STB-ND	DNP S1 and S2. (Only S3)
43	USB1	1	USB_RECEPTACLE	FARNELL: 117-7885	
44	JP11	1	4-pin header, male, TH	SAM1035-04-ND	place jumper only on Pin 1

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B.30 MSP-TS430PEU128

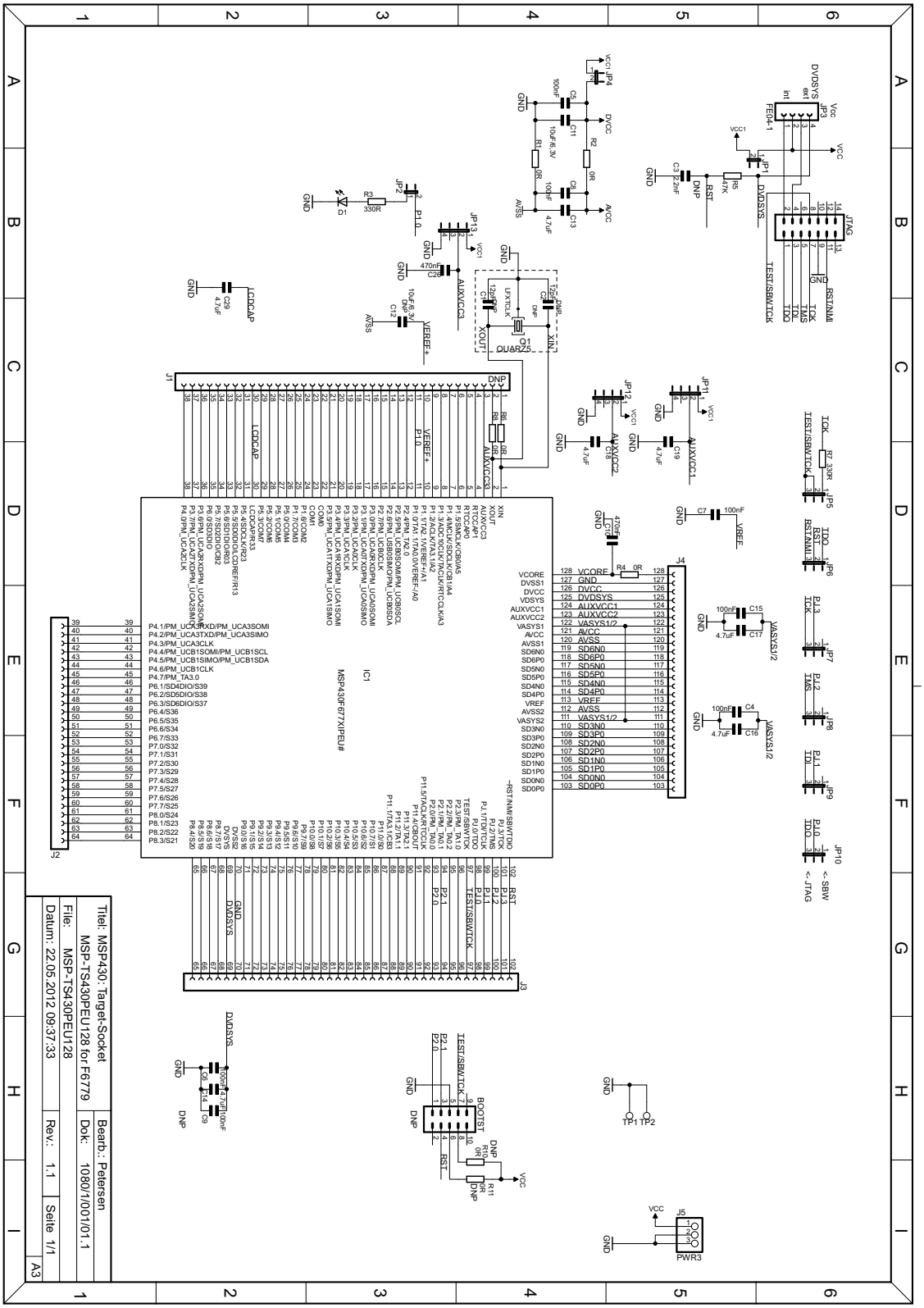

Figure B-59. MSP-TS430PEU128 Target Socket Module, Schematic

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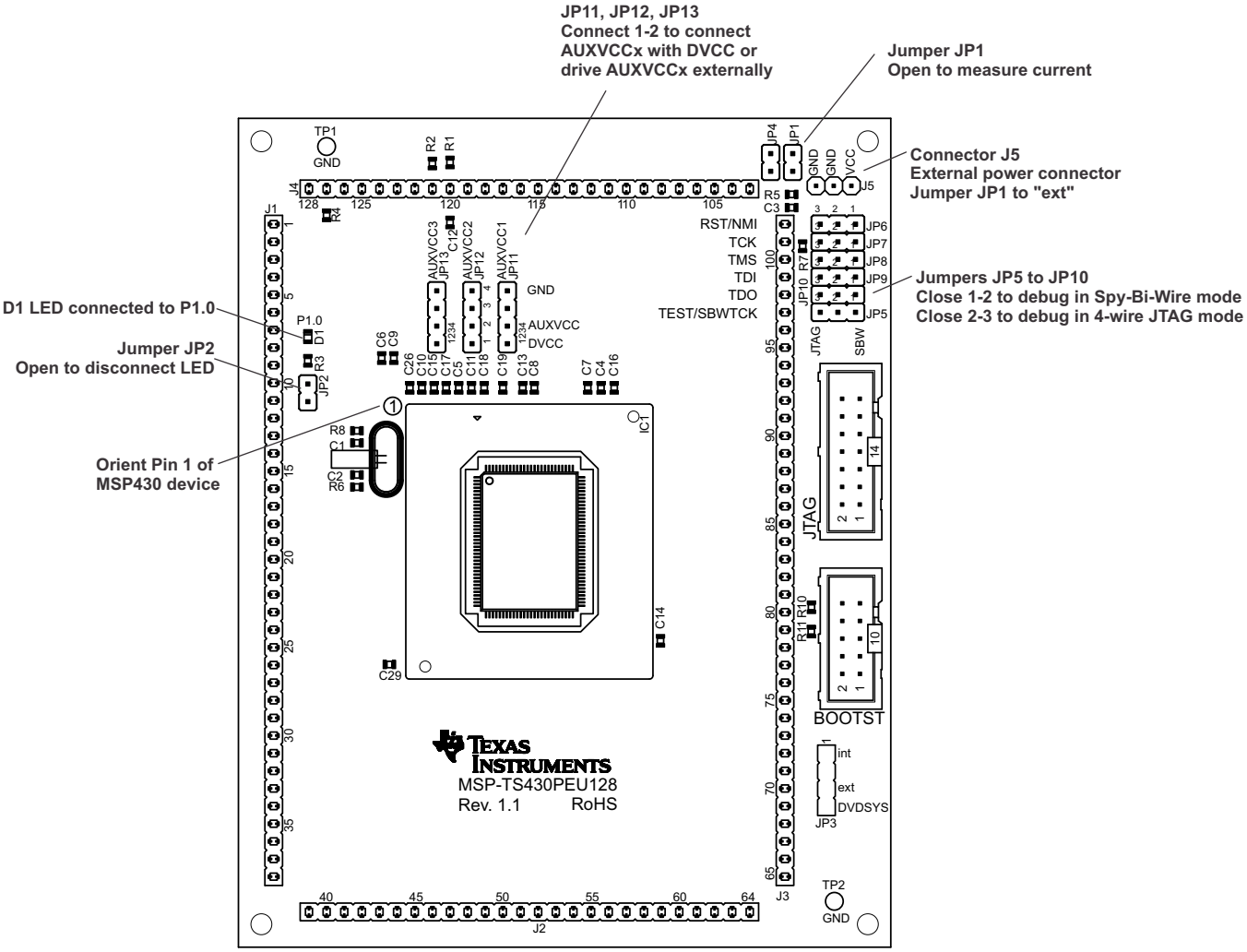

Figure B-60. MSP-TS430PEU128 Target Socket Module, PCB

NOTE: The MSP-TS430PEU128 Rev 1.1 ships with the following modifications:

- R7 value is changed to 0 Ω instead of 330 Ω.
- JTAG pin 8 is connected only to JP5 pin 3, and not to pin 2.
- JP5 pin 2 is connected to IC1 pin 97.
- BOOTST pin 7 is connected to IC1 pin 97.

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Table B-32. MSP-TS430PEU128 Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	PCB	1	94x119.4mm, 4 layers	MSP-TS430PEU128 Rev. 1.1	4 layers, green solder mask
2	D1	1	green LED, DIODE0805	516-1434-1-ND	
3	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
4	JP5, JP6, JP7, JP8, JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 1-2 (SBW)
5	JP11, JP12, JP13	3	4-pin header, male, TH	SAM1035-04-ND	Place jumpers on pins 1-2 (AVCC=VCC)
6	JP3	1	4-pin header, male, TH	SAM1035-04-ND	Place jumpers on pins 1-2
7	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10, JP11, JP12, JP13	13	Jumper	WM4592-ND	
8	R1, R2, R4, R6, R8	5	0R, 0805	541-0.0ATR-ND	
9	R10, R11	2	0R, 0805	541-0.0ATR-ND	DNP
10	C3	1	2.2nF, CSMD0805	490-1628-2-ND	DNP
11	C13, C14, C16, C17, C18, C19, C29	7	4.7uF, 6.3V, CSMD0805	587-1302-2-ND	
12	C11	1	10uF, 6.3V, CSMD0805	445-1372-2-ND	
13	C12	1	10uF, 6.3V, CSMD0805	445-1372-2-ND	DNP
14	C1, C2	2	12pF, CSMD0805	490-5531-2-ND	DNP
15	R5	1	47K, 0805	311-47KARTR-ND	
16	C4, C5, C6, C7, C8, C15	6	100nF, CSMD0805	311-1245-2-ND	
17	C9	1	100nF, CSMD0805	311-1245-2-ND	DNP
18	R3, R7	2	330R, 0805	541-330ATR-ND	
19	C10, C26	2	470nF, CSMD0805	587-1282-2-ND	
20	BOOTST	1	10-pin connector, male, TH	HRP10H-ND	DNP, keep vias free of solder
21	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
22	IC1 Socket	1	Socket: IC500-1284-009P		Manuf. Yamaichi
23	IC1	2	MSP430F67791IPEU		DNP: enclosed with kit. Is supplied by TI
24	J5	1	3-pin header, male, TH	SAM1035-03-ND	
25	Q1	1	Crystal: MS3V-T1R 32.768kHz 12.5pF ±20ppm		DNP: Crystal enclosed with kit. Keep vias free of solder
26	TP1, TP2	2	Test point		DNP, keep vias free of solder
27	J2,J4	2	26-pin header, TH	SAM1029-26-ND	DNP: Headers enclosed with kit. Keep vias free of solder.
28	J2,J4	2	26-pin receptable, TH	SAM1213-26-ND	DNP: Receptacles enclosed with kit. Keep vias free of solder.
29	J1, J3	2	38-pin header, TH	SAM1029-38-ND	DNP: Headers enclosed with kit. Keep vias free of solder.
30	J1, J3	2	38-pin receptable, TH	SAM1213-38-ND	DNP: Receptacles enclosed with kit. Keep vias free of solder.
31	Rubber feet	4	Rubber feet	Buerklin: 20H1724	apply to bottom side corners

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B.31 EM430F5137RF900

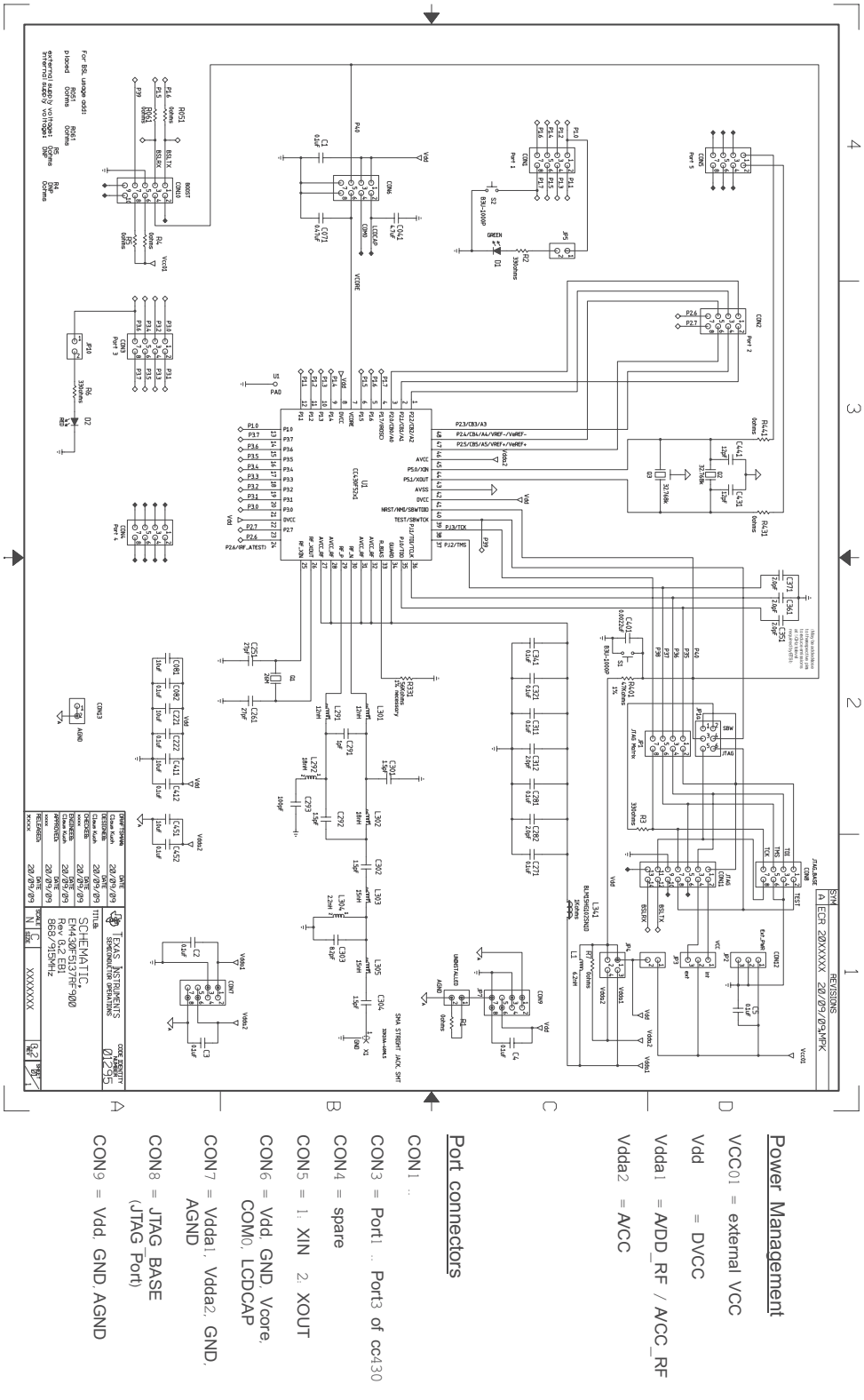
Power Management
VCC01 = external VCC
Vdd = DVCC
Vdda1 = A/DD_RF / A/CC_RF
Vdda2 = A/CC
Port connectors
CON1 ..
CON3 = Port1 .. Port3 of cc430
CON4 = spare
CON5 = 1: XIN 2: XOUT
CON6 = Vdd, GND, Vcore, COM0, LCDCAP
CON7 = Vdda1, Vdda2, GND, AGND
CON8 = JTAG_BASE (JTAG Port)
CON9 = Vdd, GND, AGND

Figure B-61. EM430F5137RF900 Target board, Schematic

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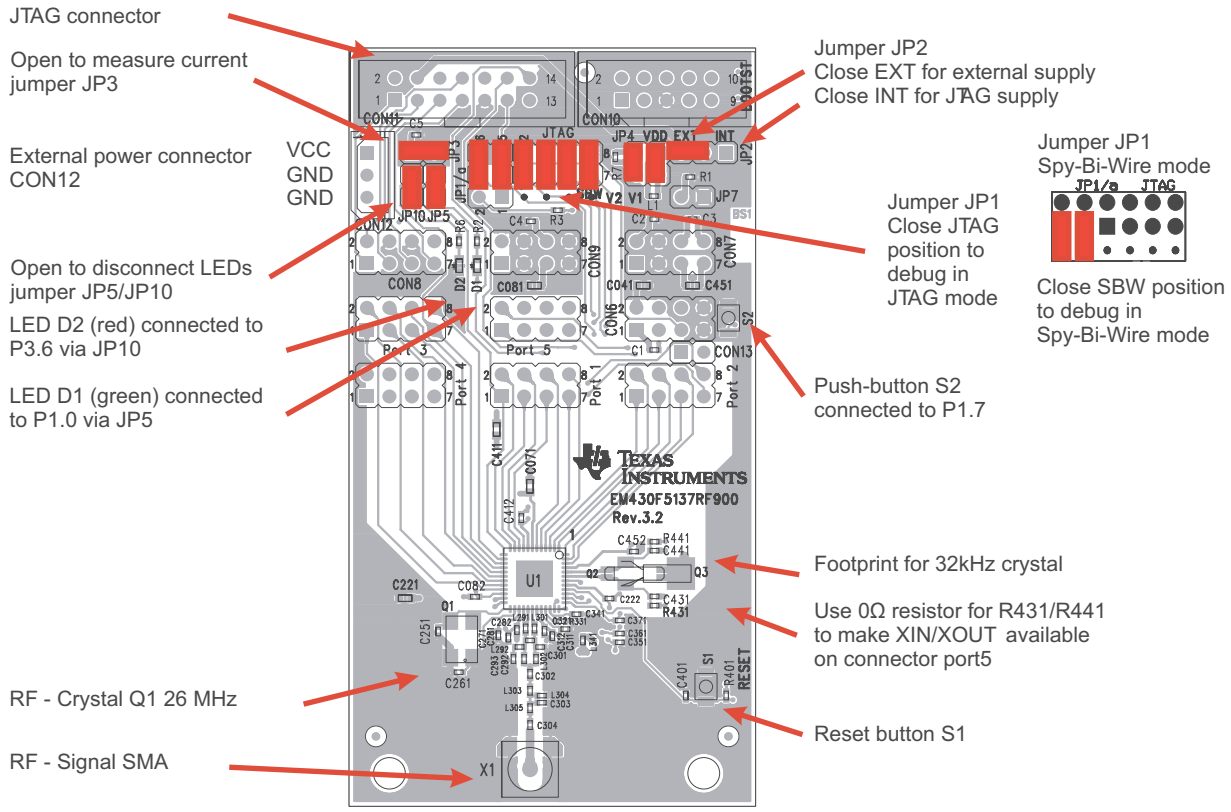
JTAG connector
Open to measure current jumper JP3
External power connector CON12
VCC
GND
GND
Open to disconnect LEDs jumper JP5/JP10
LED D2 (red) connected to P3.6 via JP10
LED D1 (green) connected to P1.0 via JP5
RF - Crystal Q1 26 MHz
RF - Signal SMA
Jumper JP2
Close EXT for external supply
Close INT for JTAG supply
Jumper JP1
Spy-Bi-Wire mode
JP1/a
JTAG
Jumper JP1
Close JTAG position to debug in JTAG mode
Close SBW position to debug in Spy-Bi-Wire mode
Push-button S2 connected to P1.7
Footprint for 32kHz crystal
Use 0Ω resistor for R431/R441 to make XIN/XOUT available on connector port5
Reset button S1
TEXAS INSTRUMENTS
EM430F5137RF900
Rev.3.2

Figure B-62. EM430F5137RF900 Target board, PCB

The battery pack that is included with the EM430F5137RF900 kit may be connected to CON12. Ensure correct battery insertion regarding the polarity as indicated in battery holder.

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Table B-33. EM430F5137RF900 Bill of Materials

Item	Reference	No. per Board	Description	Value	Manufacturer's Part Number	Manufacturer	Comment
1	Q1	1	(CUSTOMER SUPPLY) CRYSTAL, SMT, 4P, 26MHz	26M	ASX-531(CS)	AKER ELECTRONIC	
2	C1-C5, C082, C222, C271, C281, C311, C321, C341, C412, C452	14	CAPACITOR, SMT, 0402, CER, 16V, 10%, 0.1uF	0.1uF	0402YC104KAT2A	AVX	
3	C071	1	CAPACITOR, SMT, 0603, CERAMIC, 0.47uF, 16V, 10%, X5R	0.47uF	0603YD474KAT2A	AVX	
4	R401	1	RES0402, 47.0K	47kΩ	CRCW04024702F100	DALE	
5	CON11	1	HEADER, THU, MALE, 14P, 2X7, 25.4x9.2x9.45mm		09 18 514 6323	HARTING	
6	CON10	0	HEADER, THU, MALE, 10P, 2X5, 20.32x9.2x9.45mm		09 18 510 6323	HARTING	DNP
7	D1	1	LED, SMT, 0603, GREEN, 2.1V	active	APT1608MGC	KINGBRIGHT	
8	D2	1	LED, SMT, 0603, RED, 2.0V	active	APT1608EC	KINGBRIGHT	
9	Q3	0	UNINSTALLED CRYSTAL, SMT, 3P, MS1V (Customer Supply)	32.768k	MS1V-T1K (UN)	MICRO CRYSTAL	DNP
10	CON12	1	HEADER, THU, MALE, 3P, 1x3, 9.9x4.9x5.9mm		22-03-5035	MOLEX	
11	C251, C261	2	50V, 5%, 27pF	27pF	GRM36COG270J50	MURATA	
12	L341	1	FERRITE, SMT, 0402, 1.0kΩ, 250mA	1kΩ	BLM15HG102SN1D	MURATA	
13	C293	1	CAPACITOR, SMT, 0402, CERAMIC, 100pF, 50V, 0.25pF, C0G(NP0)	100pF	GRM1555C1H101JZ01	MURATA	
14	L304	1	INDUCTOR, SMT, 0402, 2.2nH, 0.1nH, 220mA, 500MHz	0.0022uH	LQP15MN2N2B02	MURATA	
15	L303, L305	2	INDUCTOR, SMT, 0402, 15nH, 2%, 450mA, 250MHz	0.015uH	LQW15AN15NG00	MURATA	
16	L292, L302	2	INDUCTOR, SMT, 0402, 18nH, 2%, 370mA, 250MHz	0.018uH	LQW15AN18NG00	MURATA	
17	C291	1	CAPACITOR, SMT, 0402, CERAMIC, 1pF, 50V, 0.05pF, C0G(NP0)	1pF	GRM1555C1H1R0WZ01	MURATA	
18	C303	1	CAPACITOR, SMT, 0402, CERAMIC, 8.2pF, 50V, 0.05pF, C0G(NP0)	8.2pF	GRM1555C1H8R2WZ01	MURATA	
19	C292, C301-C302, C304	4	CAPACITOR, SMT, 0402, CERAMIC, 1.5pF, 50V, 0.05pF, C0G(NP0)	1.5pF	GRM1555C1H1R5WZ01	MURATA	
20	L291, L301	2	INDUCTOR, SMT, 0402, 12nH, 2%, 500mA, 250MHz	0.012uH	LQW15AN12NG00	MURATA	
21	C282, C312, C351, C361, C371	5	CAPACITOR, SMT, 0402, CERAMIC, 2pF, 50V, 0.1pF, C0G	2.0pF	GRM1555C1H2R0BZ01	Murata	
22	L1	1	INDUCTOR, SMT, 0402, 6.2nH, 0.1nH, 130mA, 500MHz	6.2nH	LQP15MN6N2B02	Murata	
23	S1-S2	2	ULTRA-SMALL TACTILE SWITCH, SMT, 2P, SPST-NO, 1.2x3x2.5mm, 0.05A, 12V		B3U-1000P	OMRON	
24	R4-R5, R051, R061, R431, R441	0	UNINSTALLED RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	0Ω	ERJ-2GE0R00X	PANASONIC	DNP
24a	R7	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	0Ω	ERJ-2GE0R00X	PANASONIC	
25	R2-R3, R6	3	RESISTOR, SMT, 0402, THICK FILM, 5%, 1/16W, 330	330Ω	ERJ-2GEJ331	PANASONIC	
26	C431, C441	0	CAPACITOR, SMT, 0402, CER, 12pF, 50V, 5%, NPO	12pF	ECJ-0EC1H120J	PANASONIC	
27	C401	1	CAPACITOR, SMT, 0402, CER, 2200pF, 50V, 10%, X7R	0.0022uF	ECJ-0EB1H222K	PANASONIC	
28	R331	1	RESISTOR, SMT, THICK FILM, 56K, 1/16W, 5%	56kΩ	ERJ-2GEJ563	PANASONIC	
29	C081, C221, C411, C451	4	CAPACITOR, SMT, 0603, CERAMIC, 10uF, 6.3V, 20%, X5R	10uF	ECJ-1VB0J106M	PANASONIC	

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Table B-33. EM430F5137RF900 Bill of Materials (continued)

Item	Reference	No. per Board	Description	Value	Manufacturer's Part Number	Manufacturer	Comment
30	R1	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	0Ω	ERJ-2GE0R00X	PANASONIC	
31	C041	0	UNINSTALLED CAP CERAMIC 4.7UF 6.3V X5R 0603	4.7uF	ECJ-1VB0J475K	Panasonic	DNP
32	X1	1	SMA STRIGHT JACK, SMT		32K10A-40ML5	ROSENBERGER	
33	Q2	0	Crystal, SMT, 32.768 kHz	32.768k	MS3V-T1R	Micro Crystal	DNP
34	U1	1	DUT, SMT, PQFP, RGZ-48, 0.5mmLS, 7.15x7.15x1mm, THRM.PAD		CC430F52x1	TI	
35	JP1	1	Pin Connector 2x4pin		61300821121	WUERTH	
36	CON1-CON9	0	Pin Connector 2x4pin		61300821121	WUERTH	DNP
37	JP2	1	Pin Connector 1x3pin		61300311121	WUERTH	
38	JP3, JP5, JP10	3	Pin Connector 1x2pin		61300211121	WUERTH	
38a	JP7, CON13	0	Pin Connector 1x2pin		61300211121	WUERTH	DNP
39	JP4	1	Pin Connector 2x2pin		61300421121	WUERTH	DNP
40	JP1a	1	Pin Connector 2x3pin		61300621121	WUERTH	

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B.32 EM430F6137RF900

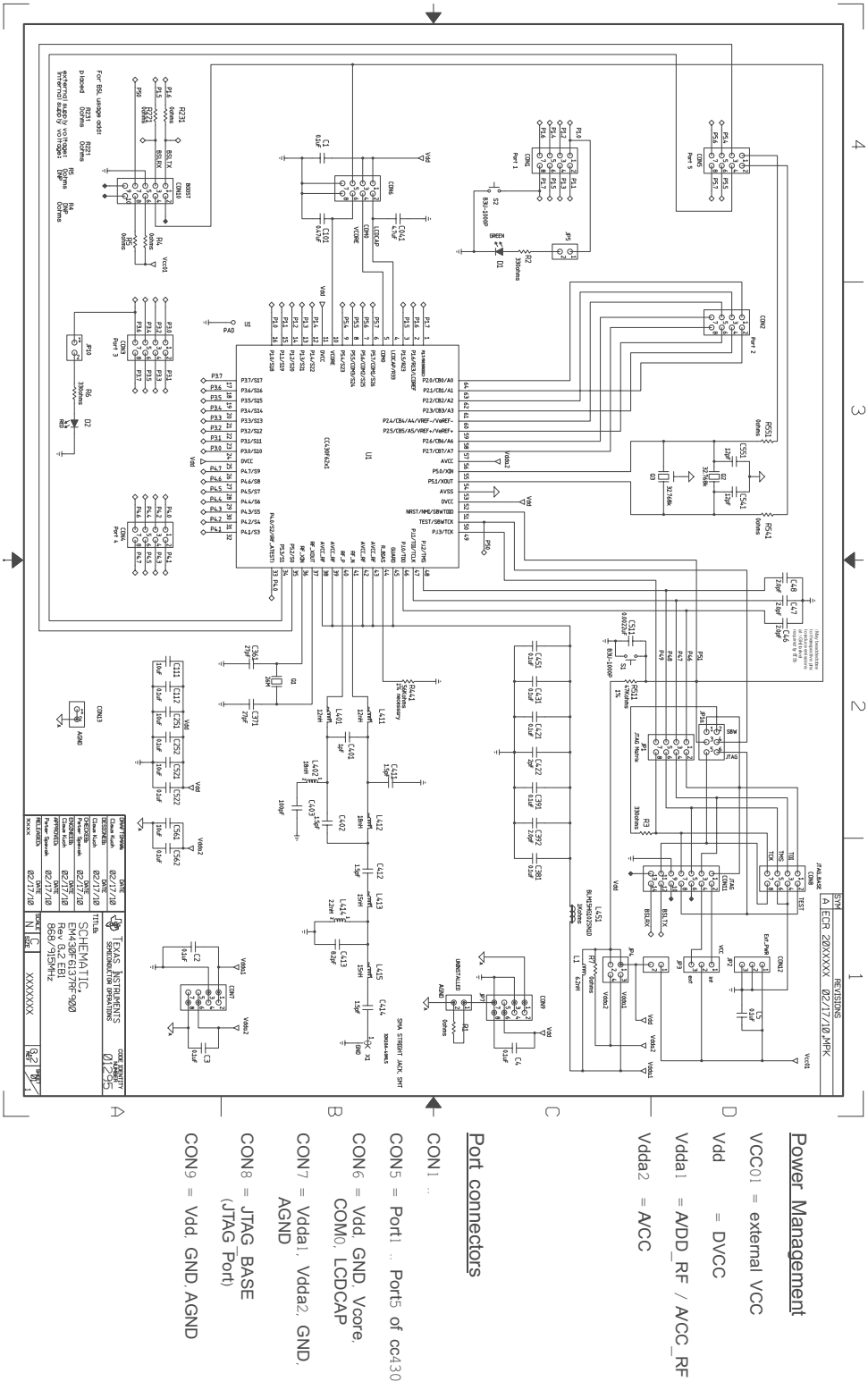
Power Management
VCC01 = external VCC
Vdd = DVCC
Vdda1 = A/DD_RF / A/CC_RF
Vdda2 = A/CC
Port connectors
CON1 ..
CON5 = Port1 .. Port5 of cc430
CON6 = Vdd, GND, Vcore, COM0, LCDCAP
CON7 = Vdda1, Vdda2, GND, AGND
CON8 = JTAG BASE (JTAG Port)
CON9 = Vdd, GND, AGND

Figure B-63. EM430F6137RF900 Target board, Schematic

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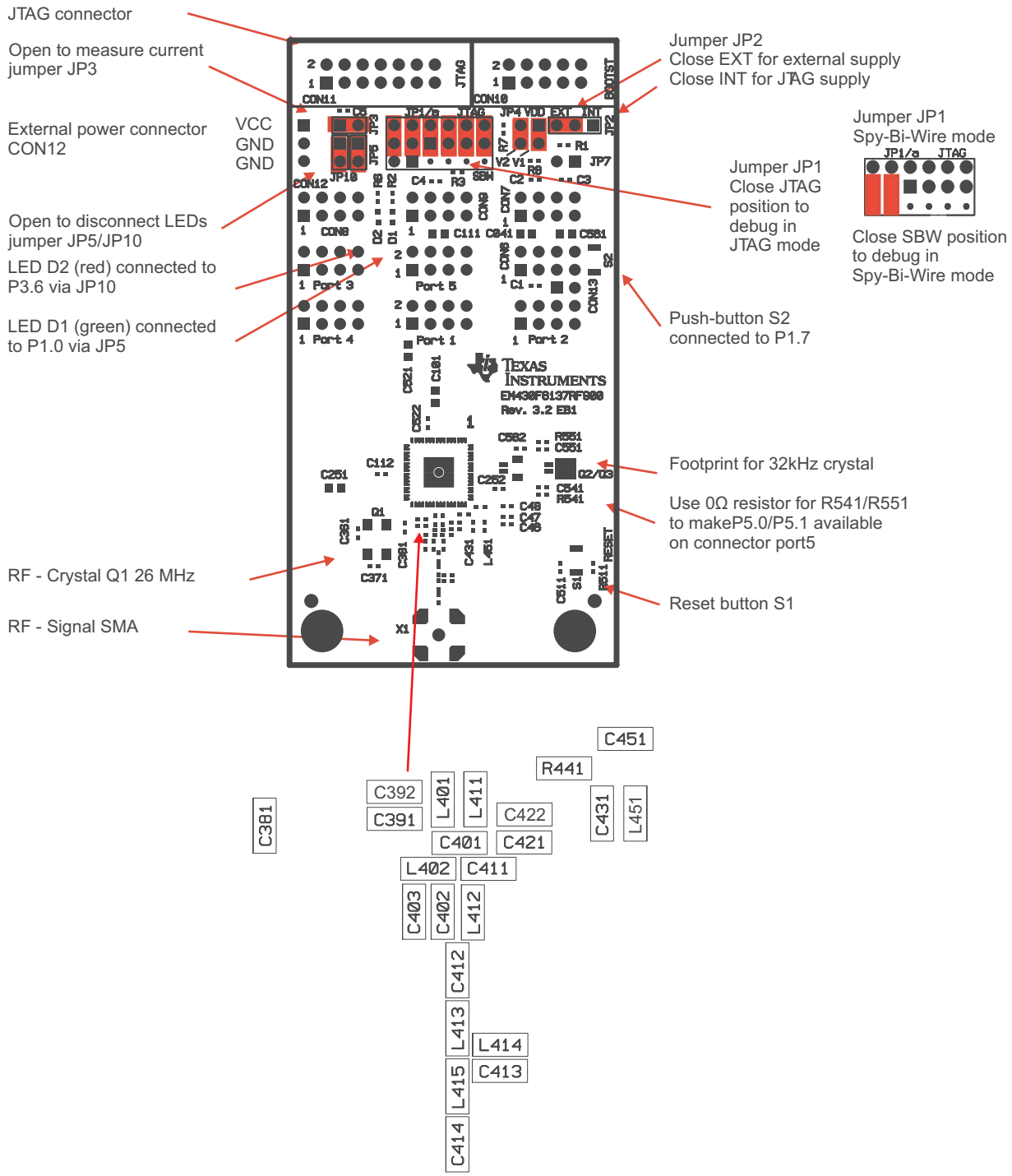

Figure B-64. EM430F6137RF900 Target board, PCB

The battery pack that is included with the EM430F6137RF900 kit may be connected to CON12. Ensure correct battery insertion regarding the polarity as indicated in battery holder.

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Table B-34. EM430F6137RF900 Bill of Materials

Pos.	Ref Des	No. per Board	Description	Part No.	Manufacturer
1	Q1	1	(CUSTOMER SUPPLY) CRYSTAL, SMT, 4P, 26MHz	ASX-531(CS)	AKER ELECTRONIC
2	C1-C5, C112, C252, C381, C391, C421, C431, C451, C522, C562	14	CAPACITOR, SMT, 0402, CER, 16V, 10%, 0.1uF	0402YC104KAT2A	AVX
3	C101	1	CAPACITOR, SMT, 0603, CERAMIC, 0.47uF, 16V, 10%, X5R	0603YD474KAT2A	AVX
4	R511	1	RES0402, 47.0K	CRCW04024702F100	DALE
5	CON11	1	HEADER, THU, MALE, 14P, 2X7, 25.4x9.2x9.45mm, 90deg	09 18 514 6323	HARTING
7	D1	1	LED, SMT, 0603, GREEN, 2.1V	APT1608MGC	KINGBRIGHT
8	D2	1	LED, SMT, 0603, RED, 2.0V	APT1608EC	KINGBRIGHT
10	CON12	1	HEADER, THU, MALE, 3P, 1x3, 9.9x4.9x5.9mm	22-03-5035	MOLEX
11	C361, C371	2	50V, ±5%, 27pF	GRM36COG270J50	MURATA
12	L451	1	FERRITE, SMT, 0402, 1.0kΩ, 250mA	BLM15HG102SN1D	MURATA
13	C403	1	CAPACITOR, SMT, 0402, CERAMIC, 100pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H101JZ01	MURATA
14	L414	1	INDUCTOR, SMT, 0402, 2.2nH, ±0.2nH, 1000mA, 250MHz	LQW15AN2N2C10	MURATA
15	L413, L415	2	INDUCTOR, SMT, 0402, 15nH, ±5%, 460mA, 250MHz	LQW15AN15NJ00	MURATA
16	L402, L412	2	INDUCTOR, SMT, 0402, 18nH, ±5%, 370mA, 250MHz	LQW15AN18NJ00	MURATA
17	C401	1	CAPACITOR, SMT, 0402, CER, 1pF, 50V, ±0.25pF, NP0	GJM1555C1H1R0CB01D	MURATA
18	C413	1	CAPACITOR, SMT, 0402, CERAMIC, 8.2pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H8R2CZ01	MURATA
19	C402, C411-C412, C414	4	CAPACITOR, SMT, 0402, CERAMIC, 1.5pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H1R5CZ01	MURATA
20	L401, L411	2	INDUCTOR, SMT, 0402, 12nH, ±5%, 500mA, 250MHz	LQW15AN12NJ00	MURATA
21	C46-C48, C392, C422	5	CAPACITOR, SMT, 0402, CERAMIC, 2.0pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H2R0CZ01	Murata
22	L1	1	INDUCTOR, SMT, 0402, 6.2nH, ±0.1nH, 700mA, 250MHz	LQW15AN6N2D00	Murata
23	S1-S2	2	ULTRA-SMALL TACTILE SWITCH, SMT, 2P, SPST-NO, 1.2x3x2.5mm, 0.05A, 12V	B3U-1000P	OMRON
24	R7	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	ERJ-2GE0R00X (UN)	PANASONIC
25	R2-R3, R6	3	RESISTOR, SMT, 0402, THICK FILM, 5%, 1/16W, 330	ERJ-2GEJ331	PANASONIC
27	C511	1	CAPACITOR, SMT, 0402, CER, 2200pF, 50V, 10%, X7R	ECJ-0EB1H222K	PANASONIC
28	C111, C251, C521, C561	4	CAPACITOR, SMT, 0603, CERAMIC, 10uF, 6.3V, 20%, X5R	ECJ-1VB0J106M	PANASONIC
28a	C041	1	CAP CERAMIC 4.7UF 6.3V X5R 0603	ECJ-1VB0J475M	PANASONIC
29	R441	1	RESISTOR, SMT, THICK FILM, 56K, 1/16W, 1%	ERJ-2RKF5602	PANASONIC
30	R1	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	ERJ-2GE0R00X	PANASONIC
31	X1	1	SMA STRIGHT JACK, SMT	32K10A-40ML5	ROSENBERGER

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Table B-34. EM430F6137RF900 Bill of Materials (continued)

Pos.	Ref Des	No. per Board	Description	Part No.	Manufacturer
33	U1	1	DUT, SMT, PQFP, RGC-64, 0.5mmLS, 9.15x9.15x1mm, THRM.PAD	CC430F6137	TI
34	JP1	1	Pin Connector 2x4pin	61300821121	WUERTH
35	JP2	1	Pin Connector 1x3pin	61300311121	WUERTH
36a	JP3, JP5, JP10	3	Pin Connector 1x2pin	61300211121	WUERTH
38	JP1a	1	Pin Connector 2x3pin	61300621121	WUERTH

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B.33 EM430F6147RF900

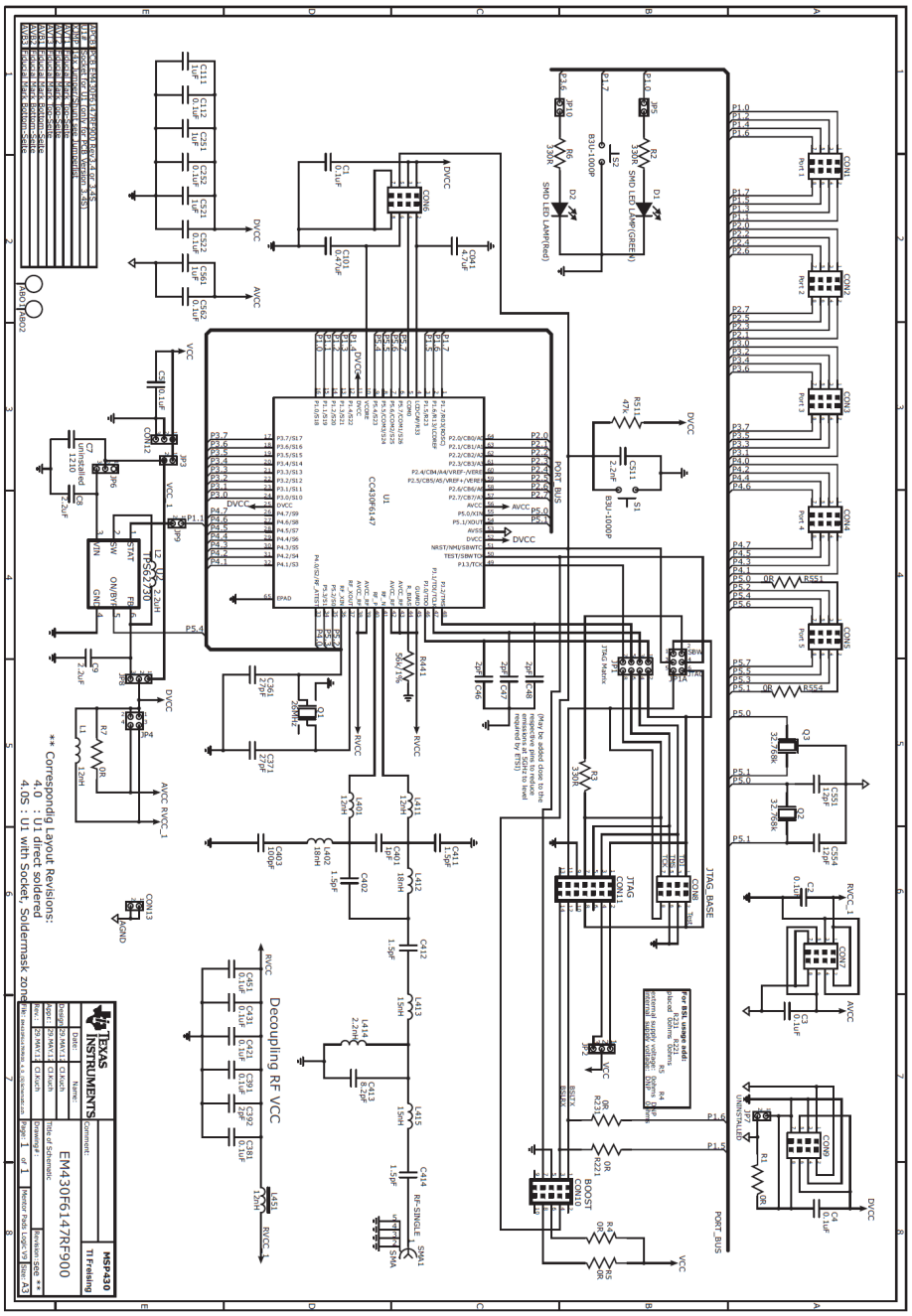

Figure B-65. EM430F6147RF900 Target Board, Schematic

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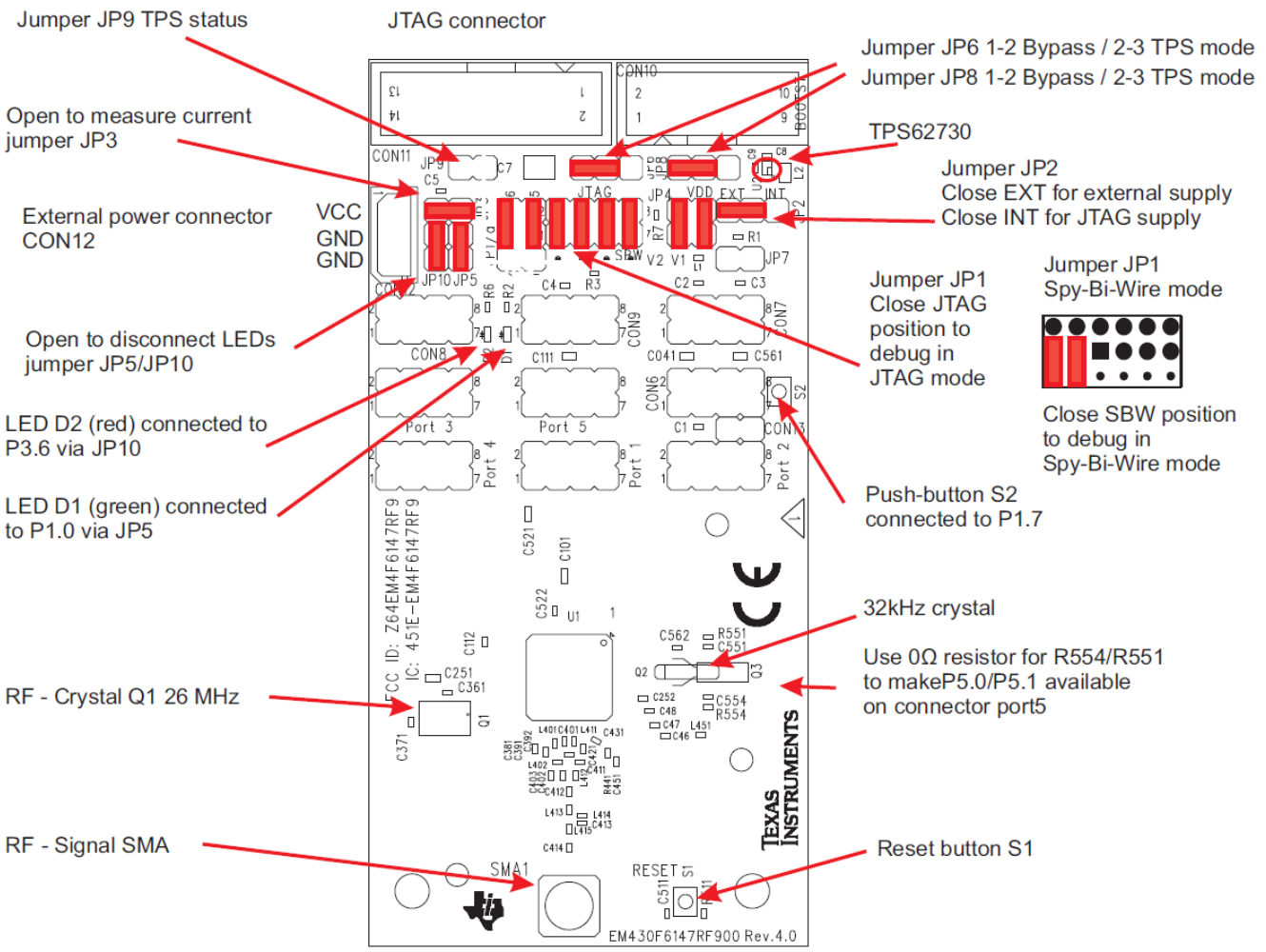
Jumper JP9 TPS status
JTAG connector
Jumper JP6 1-2 Bypass / 2-3 TPS mode
Jumper JP8 1-2 Bypass / 2-3 TPS mode
Open to measure current jumper JP3
TPS62730
Jumper JP2
Close EXT for external supply
Close INT for JTAG supply
External power connector CON12
VCC
GND
GND
Jumper JP1
Close JTAG position to debug in JTAG mode
Jumper JP1
Spy-Bi-Wire mode
Open to disconnect LEDs jumper JP5/JP10
Close SBW position to debug in Spy-Bi-Wire mode
LED D2 (red) connected to P3.6 via JP10
Push-button S2 connected to P1.7
LED D1 (green) connected to P1.0 via JP5
32kHz crystal
Use 0Ω resistor for R554/R551 to makeP5.0/P5.1 available on connector port5
RF - Crystal Q1 26 MHz
RF - Signal SMA
Reset button S1
EM430F6147RF900 Rev.4.0

Figure B-66. EM430F6147RF900 Target Board, PCB

The battery pack which comes with the EM430F6147RF900 kit may be connected to CON12. Ensure correct battery insertion regarding the polarity as indicated in battery holder.

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Table B-35. EM430F6147RF900 Bill of Materials

Pos.	Ref Des	No. per Board	Description	Part No.	Manufacturer
1	Q1	1	(CUSTOMER SUPPLY) CRYSTAL, SMT, 4P, 26MHz	ASX-531(CS)	AKER ELECTRONIC
2	C1-5 C112 C252 C381 C391 C421 C431 C451 C522 C562	14	CAPACITOR, SMT, 0402, CER, 16V, 10%, 0.1uF	0402YC104KAT2A	AVX
3	C101	1	CAPACITOR, SMT, 0603, CERAMIC, 0.47uF, 16V, 10%, X5R	0603YD474KAT2A	AVX
4	R511	1	RES0402, 47.0K	CRCW04024702F100	DALE
5	CON11	1	HEADER, THU, MALE, 14P, 2X7, 25.4x9.2x9.45mm, 90deg	09 18 514 6323	HARTING
7	D1	1	LED, SMT, 0603, GREEN, 2.1V	APT1608MGC	KINGBRIGHT
8	D2	1	LED, SMT, 0603, RED, 2.0V	APT1608EC	KINGBRIGHT
10	CON12	1	HEADER, THU, MALE, 3P, 1x3, 9.9x4.9x5.9mm	22-03-5035	MOLEX
11	C361, C371	2	50V, ±5%, 27pF	GRM36COG270J50	MURATA
12	L451	1	Inductor, SMD, 0402, 12nH, 5%, 370mA	LQW15AN12NJ00	MURATA
13	C403	1	CAPACITOR, SMT, 0402, CERAMIC, 100pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H101JZ01	MURATA
14	L414	1	INDUCTOR, SMT, 0402, 2.2nH, ±0.2nH, 1000mA, 250MHz	LQW15AN2N2C10	MURATA
15	L413	1	Inductor, SMD, 0402, 15nH, 5%, 370mA, 250MHz	LQW15AN15NJ00	MURATA
15	L415	1	INDUCTOR,SMT,0402,15nH,±5%,460mA,250 MHz	LQW15AN15NJ00	MURATA
16	L402, L412	2	Inductor, SMD, 0402, 18nH, 5%, 460mA, 250MHz	LQW15AN18NJ00	MURATA
17	C401	1	CAPACITOR, SMT, 0402, CER, 1pF, 50V, ±0.25pF, NP0	GJM1555C1H1R0CB01D	MURATA
18	C413	1	CAPACITOR, SMT, 0402, CERAMIC, 8.2pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H8R2CZ01	MURATA
19	C402, C411-C412, C414	4	CAPACITOR, SMT, 0402, CERAMIC, 1.5pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H1R5CZ01	MURATA
20	L1, L401, L411	3	INDUCTOR, SMT, 0402, 12nH, ±5%, 500mA, 250MHz	LQW15AN12NJ00	MURATA
21	C46-C48, C392	4	CAPACITOR, SMT, 0402, CERAMIC, 2.0pF, 50V, ±0.25pF, C0G(NP0)	GRM1555C1H2R0CZ01	MURATA
22	L2	1	Inductor, SMD, 0805, 2.2uH, 20%, 600mA, 50MHz	LQM21PN2R2MC0	MURATA
23	S1-S2	2	ULTRA-SMALL TACTILE SWITCH, SMT, 2P, SPST-NO, 1.2x3x2.5mm, 0.05A, 12V	B3U-1000P	OMRON
24	R1, R7, R551, R554	4	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	ERJ-2GE0R00X (UN)	PANASONIC
25	R2-R3, R6	3	RESISTOR, SMT, 0402, THICK FILM, 5%, 1/16W, 330	ERJ-2GEJ331	PANASONIC
27	C511	1	CAPACITOR, SMT, 0402, CER, 2200pF, 50V, 10%, X7R	ECJ-0EB1H222K	PANASONIC
28	C111, C251, C521, C561	4	CAPACITOR, SMT, 0603, CERAMIC, 1uF, 6.3V, 20%, X5R	ECJ-1VB0J105K	PANASONIC
28a	C041	1	CAP CERAMIC 4.7UF 6.3V X5R 0603	ECJ-1VB0J475M	PANASONIC
29	R441	1	RESISTOR, SMT, THICK FILM, 56K, 1/16W, 1%	ERJ-2RKF5602	PANASONIC
30	X1	1	SMA STRIGHT JACK, SMT	32K10A-40ML5	ROSENBERGER

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Table B-35. EM430F6147RF900 Bill of Materials (continued)

Pos.	Ref Des	No. per Board	Description	Part No.	Manufacturer
31	U1	1	DUT, SMT, PQFP, RGC-64, 0.5mmLS, 9.15x9.15x1mm, THRM.PAD	CC430F6147	TI
33	U2	1	IC, Step Down Converter with Bypass Mode for Low Power Wireless	TPS62370	TI
34	JP1	1	Pin Connector 2x4pin	61300821121	WUERTH
35	JP2, JP6, JP8	3	Pin Connector 1x3pin	61300311121	WUERTH
36a	JP3, JP5, JP9, JP10	4	Pin Connector 1x2pin	61300211121	WUERTH
38	JP1a	1	Pin Connector 2x3pin	61300621121	WUERTH
38	C7	1	Capacitor, Ceramic, 1206, 16V, X5R, 20%	GRM31CR61C226ME15L	MURATA
38	C8-9	2	CAP, SMD, Ceramic, 0402, 2.2uF, X5R	GRM155R60J225ME15D	MURATA
38	C041	1	CAP, SMD, Ceramic, 0603, 4.7uF, 16V, 10%, X5R		MURATA

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B.34 MSP-FET430PIF

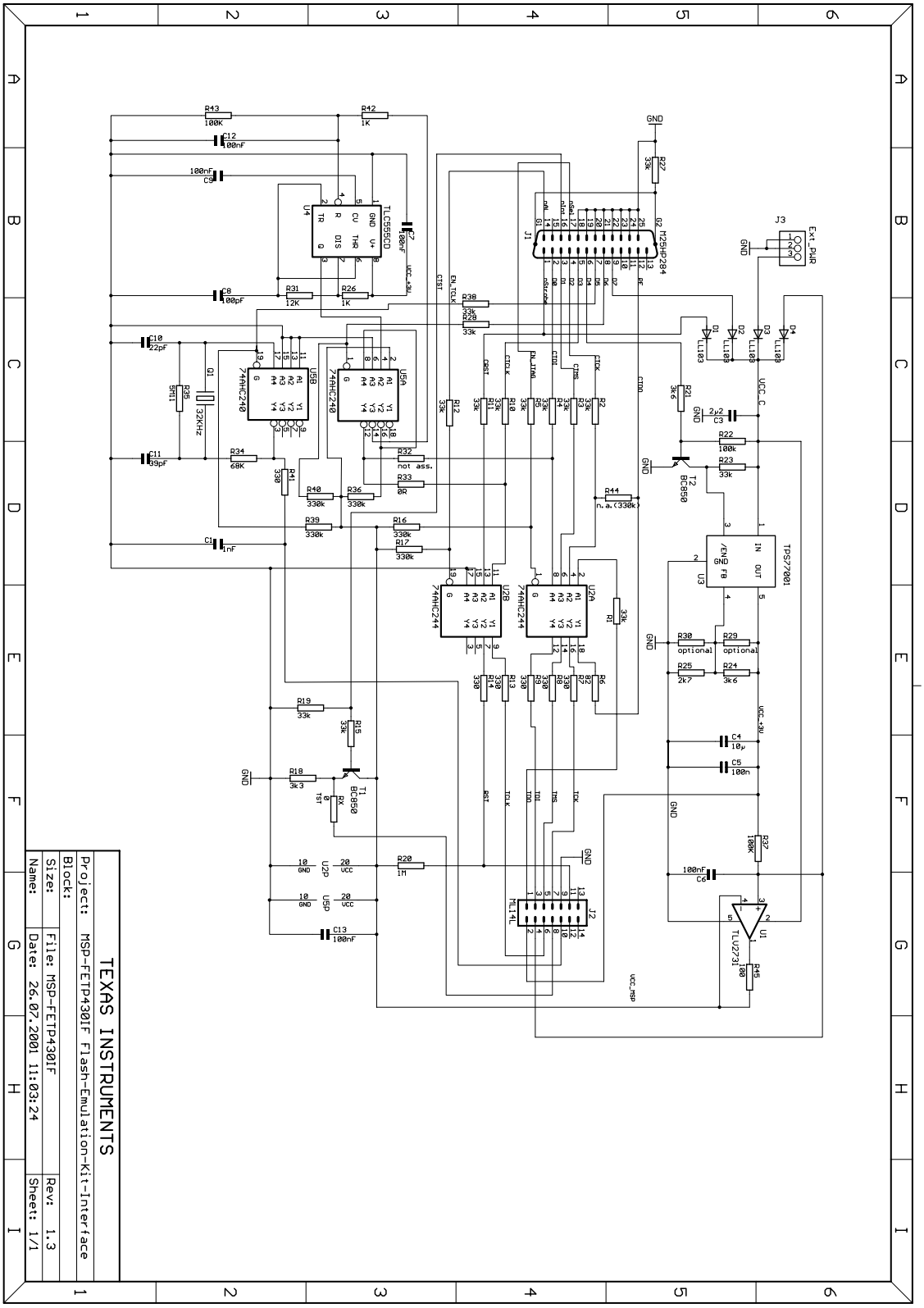

Figure B-67. MSP-FET430PIF FET Interface Module, Schematic

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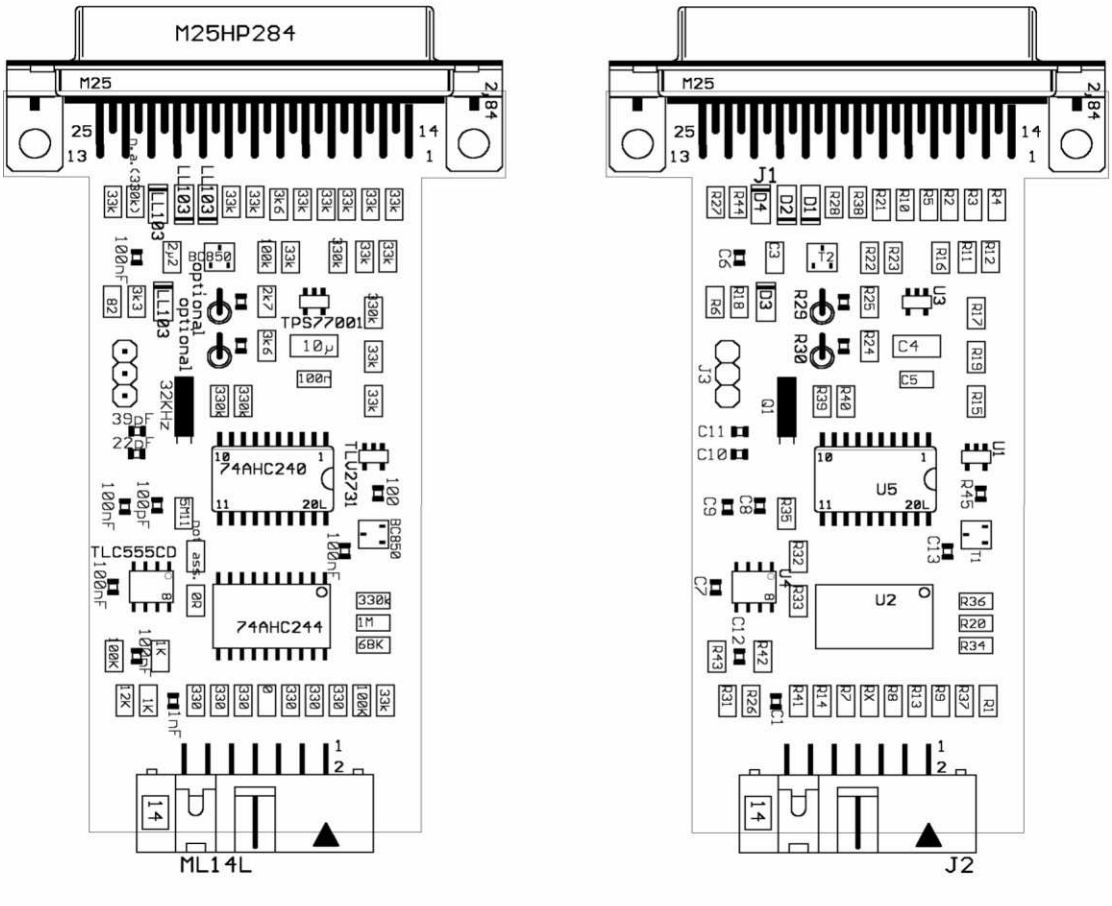

Figure B-68. MSP-FET430PIF FET Interface Module, PCB

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B.35 MSP-FET430UIF

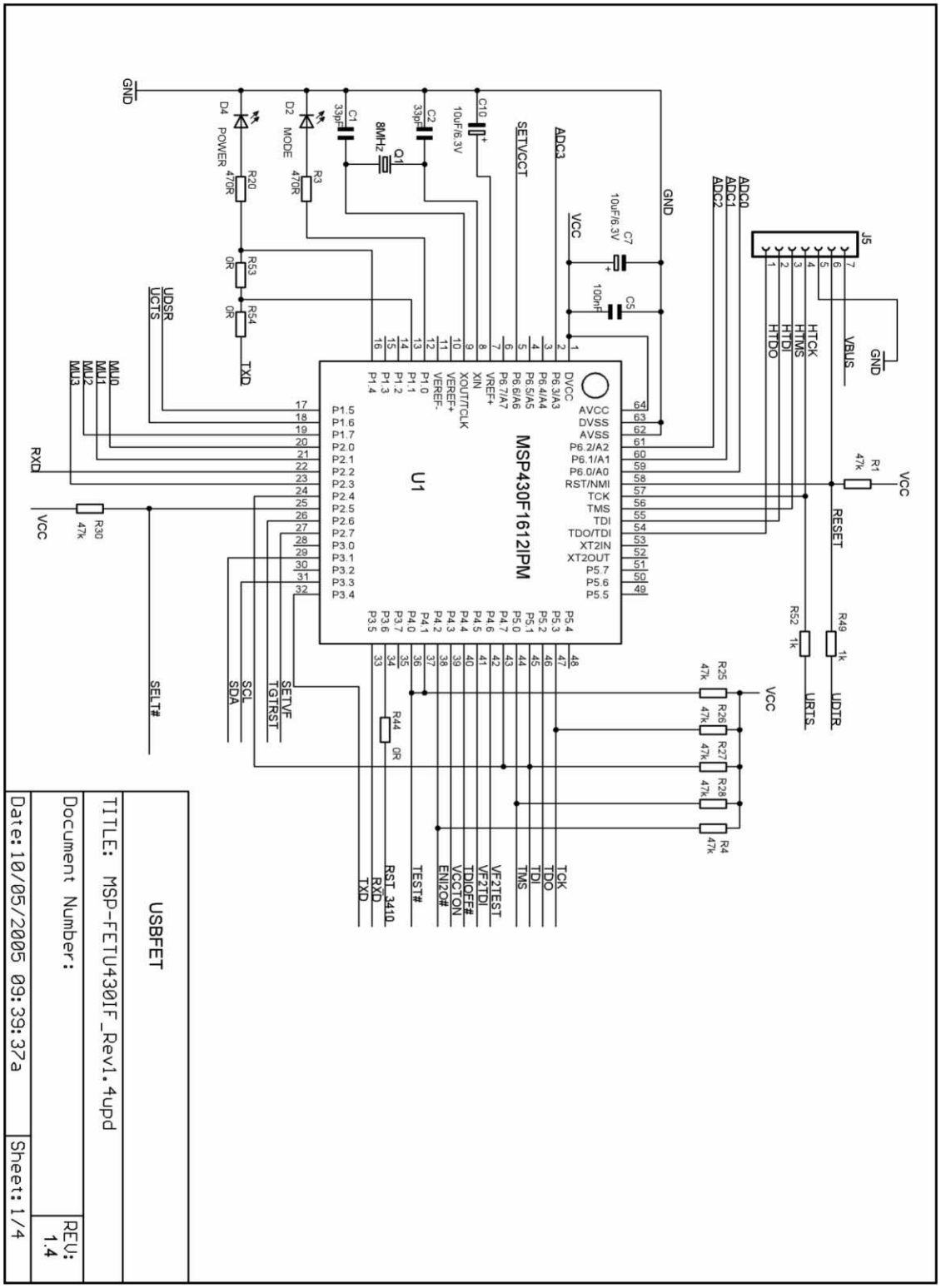

Figure B-69. MSP-FET430UIF USB Interface, Schematic (1 of 4)

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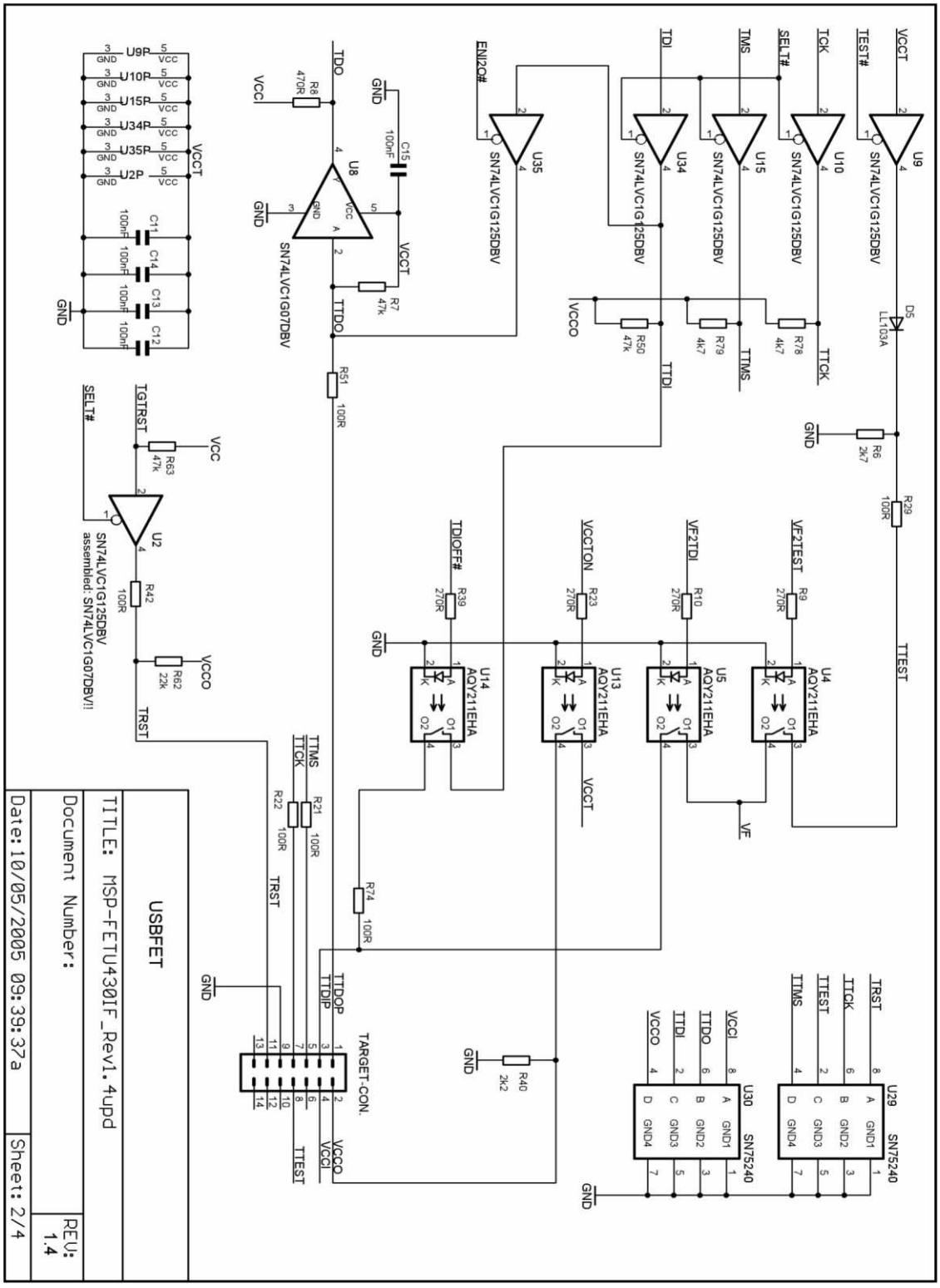

Figure B-70. MSP-FET430UIF USB Interface, Schematic (2 of 4)

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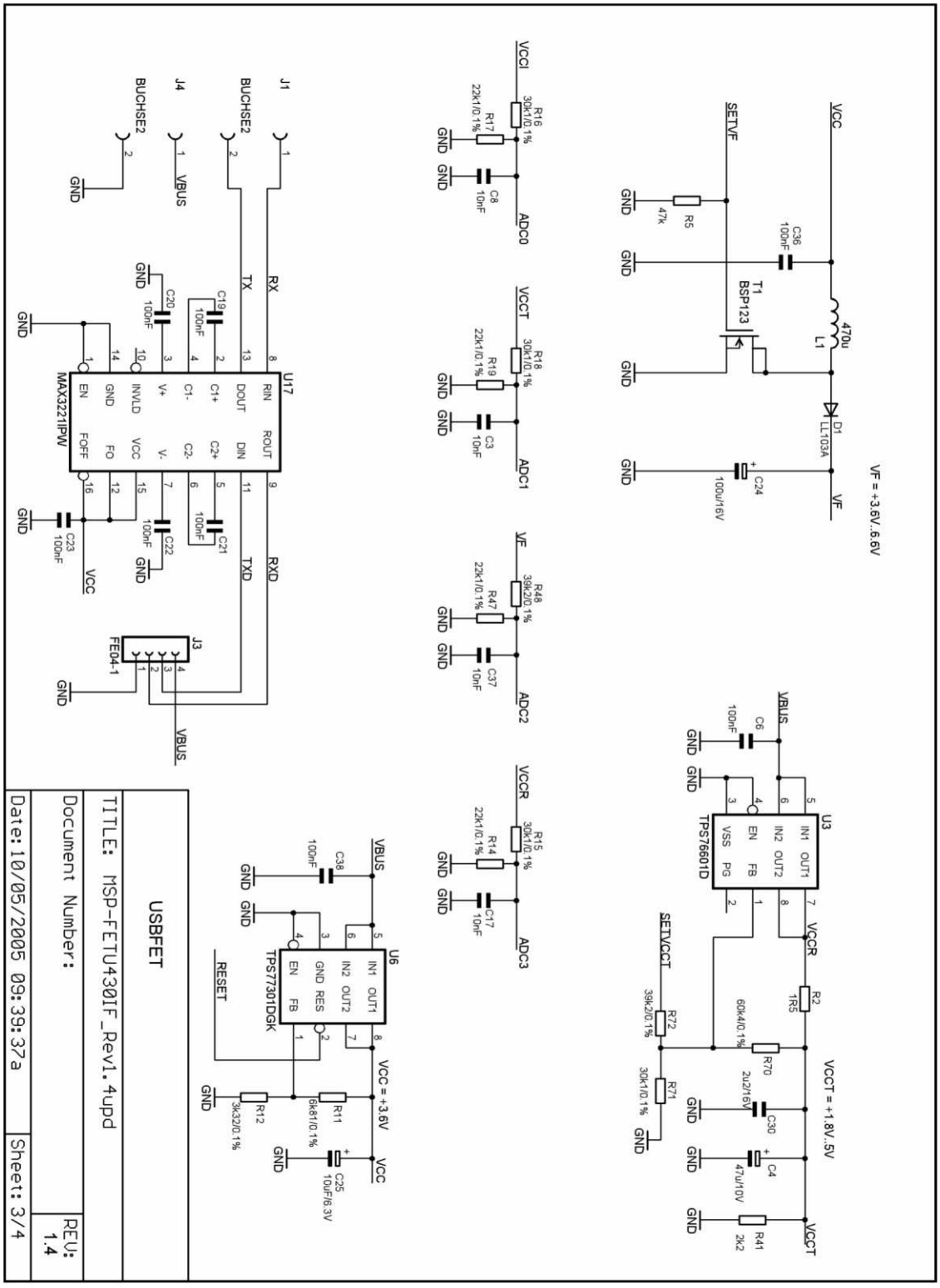

Figure B-71. MSP-FET430UIF USB Interface, Schematic (3 of 4)

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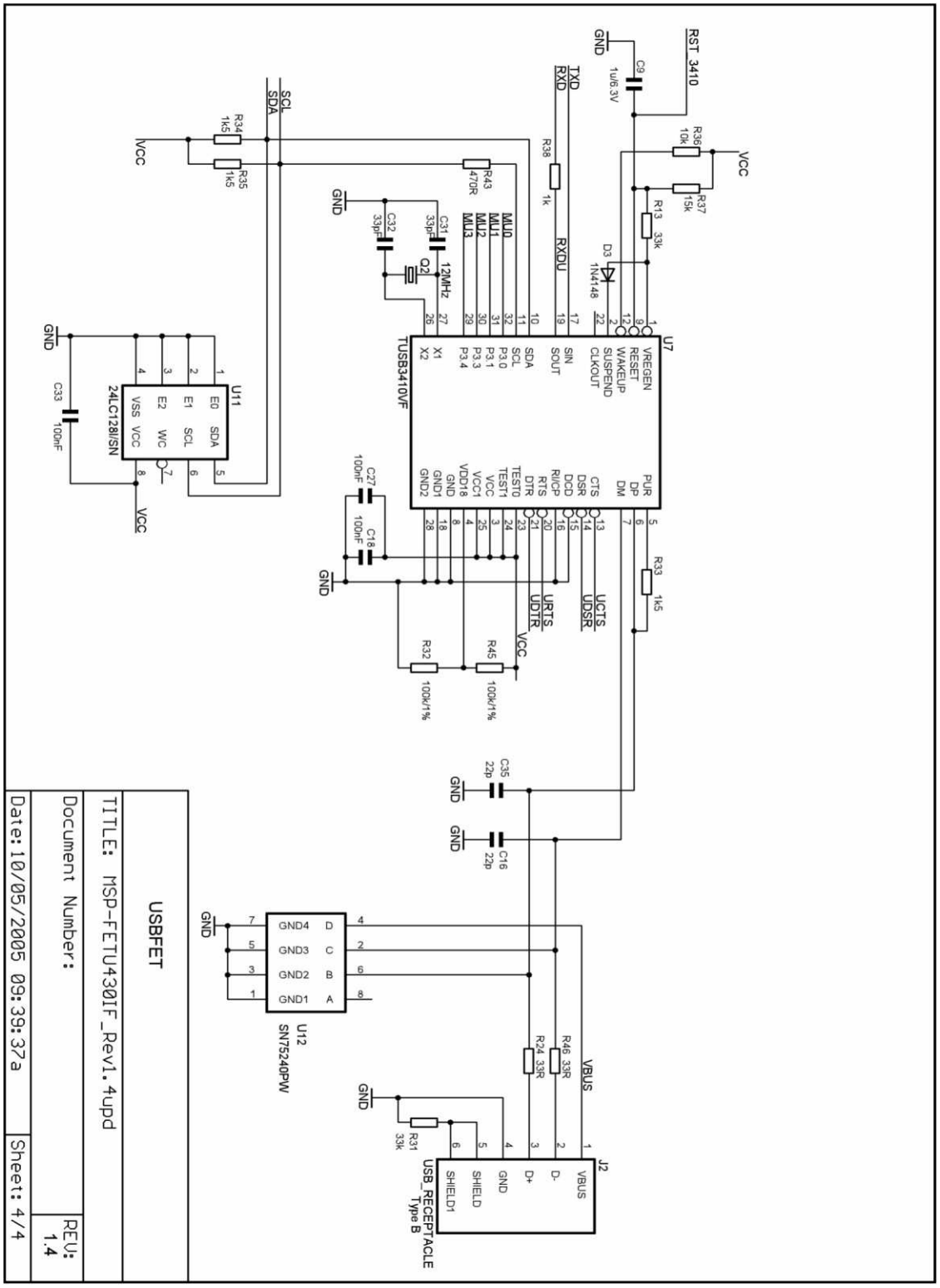

Figure B-72. MSP-FET430UIF USB Interface, Schematic (4 of 4)

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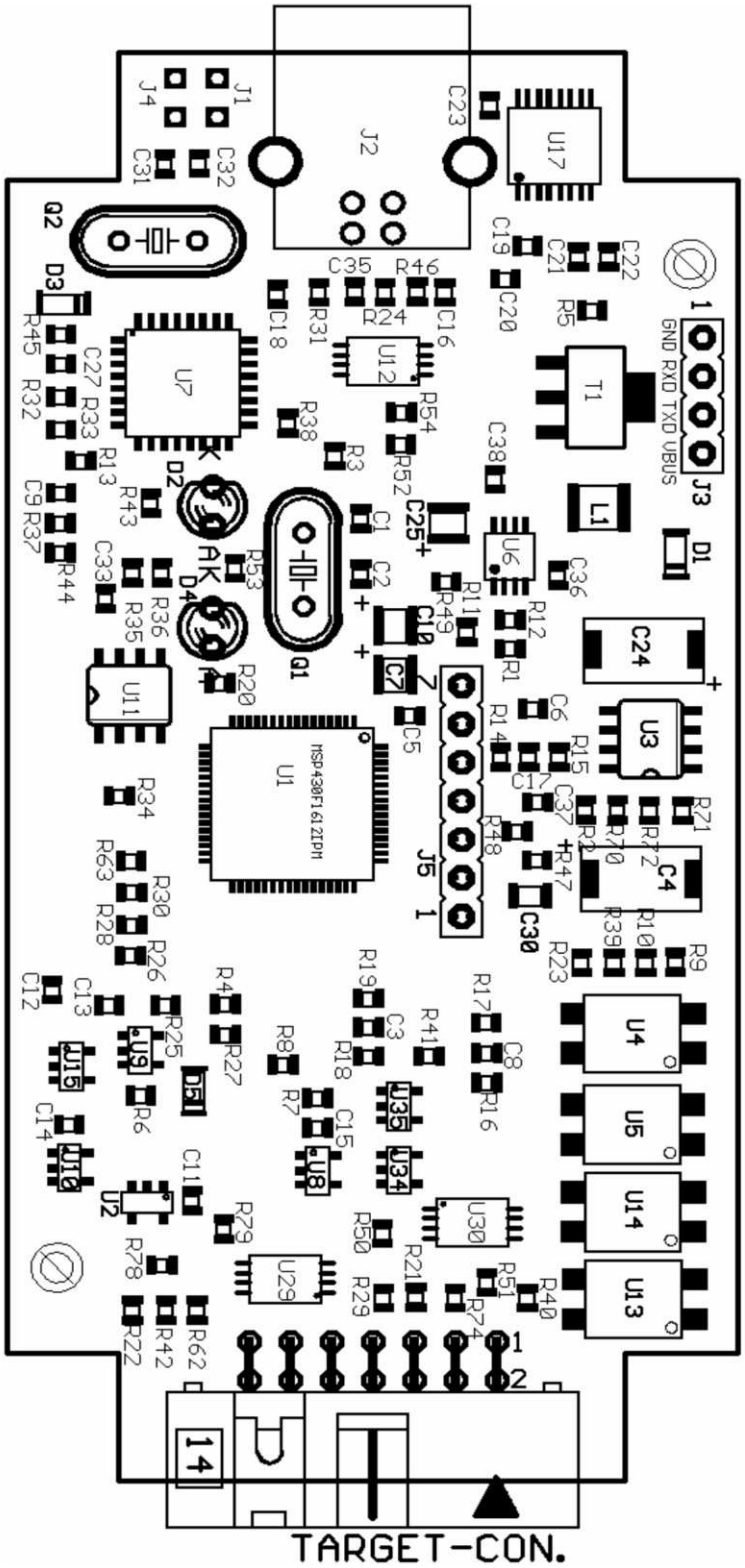

Figure B-73. MSP-FET430UIF USB Interface, PCB

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B.35.1 MSP-FET430UIF Revision History

Revision 1.3

- Initial released hardware version

Assembly change on 1.3 (May 2005)

- R29, R51, R42, R21, R22, R74: value changed from 330R to 100R

Changes 1.3 to 1.4 (Aug 2005)

- J5: VBUS and RESET additionally connected
- R29, R51, R42, R21, R22, R74: value changed from 330R to 100R
- U1, U7: F1612 can reset TUSB3410; R44 = 0R added
- TARGET-CON.: pins 6, 10, 12, 13, 14 disconnected from GND
- Firmware-upgrade option through BSL: R49, R52, R53, R54 added; R49, R52 are currently DNP
- Pullups on TCK and TMS: R78, R79 added
- U2: Changed from SN74LVC1G125DBV to SN74LVC1G07DBV

NOTE: Using a locally powered target board with hardware revision 1.4

Using an MSP-FET430UIF interface hardware revision 1.4 with populated R62 in conjunction with a locally powered target board is not possible. In this case, the target device RESET signal is pulled down by the FET tool. It is recommended to remove R62 to eliminate this restriction. This component is located close to the 14-pin connector on the MSP-FET430UIF PCB. See the schematic and PCB drawings in this document for the exact location of this component.

Assembly change on 1.4 (January 2006)

- R62: not populated

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Hardware Installation Guide

This section describes the hardware installation process of the following USB debug interfaces on a PC running Windows XP:

- MSP-FET430UIF
- eZ430-F2013
- eZ430-RF2500
- eZ430-Chronos
- eZ430-RF2780
- eZ430-RF2560
- MSP-WDSxx "Metawatch"
- LaunchPad (MSP-EXP430G2)
- MSP-EXP430FR5739
- MSP-EXP430F5529

The installation procedure for other supported versions of Windows is very similar and, therefore, not shown here.

Topic **Page**

C.1 Hardware Installation **148**

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C.1 Hardware Installation

Table C-1 shows the USB VIDs and PIDs used in MSP430 tools.

Table C-1. USB VIDs and PIDs Used in MSP430 Tools

Tool	USB VID	USB PID	INF File Name
eZ430-F2013	0x0451	0xF430	usbuart3410.inf
eZ430-RF2500	0x0451	0xF432	430CDC.inf
eZ430-RF2780	0x0451	0xF432	430CDC.inf
eZ430-RF2560	0x0451	0xF432	430CDC.inf
MSP-WDSxx "Metawatch"	0x0451	0xF432	430CDC.inf
eZ430-Chronos	0x0451	0xF432	430CDC.inf
MSP-FET430UIF(1)	0x2047	0x0010	msp430tools.inf
LaunchPad (MSP-EXP430G2)	0x0451	0xF432	430CDC.inf
MSP-EXP430FR5739	0x0451	0xF432	430CDC.inf
MSP-EXP430F5529	0x0451	0xF432	430CDC.inf

(1) The older MSP-FET430UIF used with IAR versions before v5.20.x and CCS versions before v5.1 has VID 0x0451 and PID 0xF430. With the firmware update, it is updated to the 0x2047 and 0x0010, respectively.

1. Before connecting of the USB Debug Interface with a USB cable to a USB port of the PC the one of IDEs (CCS or IAR) should be installed. The IDE installation isntalls also drivers for USB Debug Interfaces without user interaction. After IDE installation the USB Debug Interface can be connected and will be ready to work within few seconds.
2. The driver can be also installed manually. After plug in the USB Debug Interface to USB port of the PC the Hardware Wizard starts automatically and opens the "Found New Hardware Wizard" window.
3. Select "Install from a list or specific location (Advanced)" (see Figure C-1).

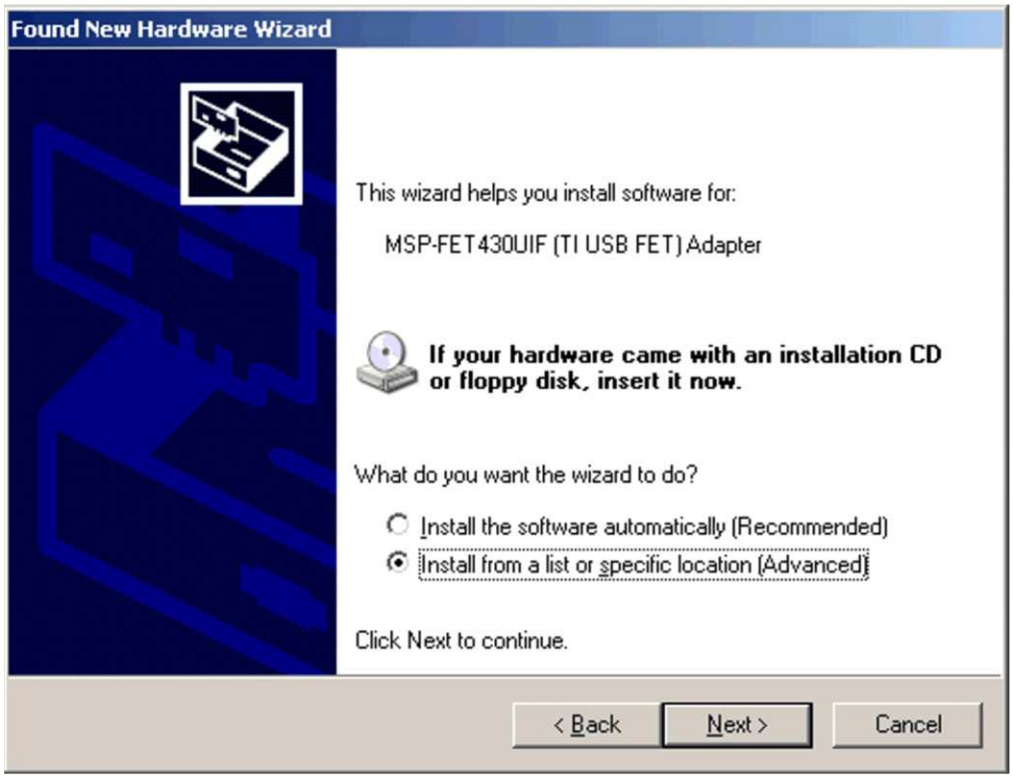
Found New Hardware Wizard
This wizard helps you install software for:
MSP-FET430UIF (TI USB FET) Adapter
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Figure C-1. Windows XP Hardware Wizard

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4. Browse to the folder where the driver information files are located (see Figure C-2).
   For CCS, the default folder is: c:\ti\ccsv5\ccs_base\emulation\drivers\msp430\USB_CDC, or
   c:\ti\ccsv5\ccs_base\emulation\drivers\msp430\USB_FET_XP_XX, or
   c:\ti\ccsv5\ccs_base\emulation\drivers\msp430\USB_eZ-RF depending of firmware version of the tool.
   For IAR Embedded Workbench, the default folder is: <Installation Root>\Embedded Workbench x.x\ 430\drivers\TIUSBFET\eZ430-UART, or
   <Installation Root>\Embedded Workbench x.x\ 430\drivers\<Win_OS>.

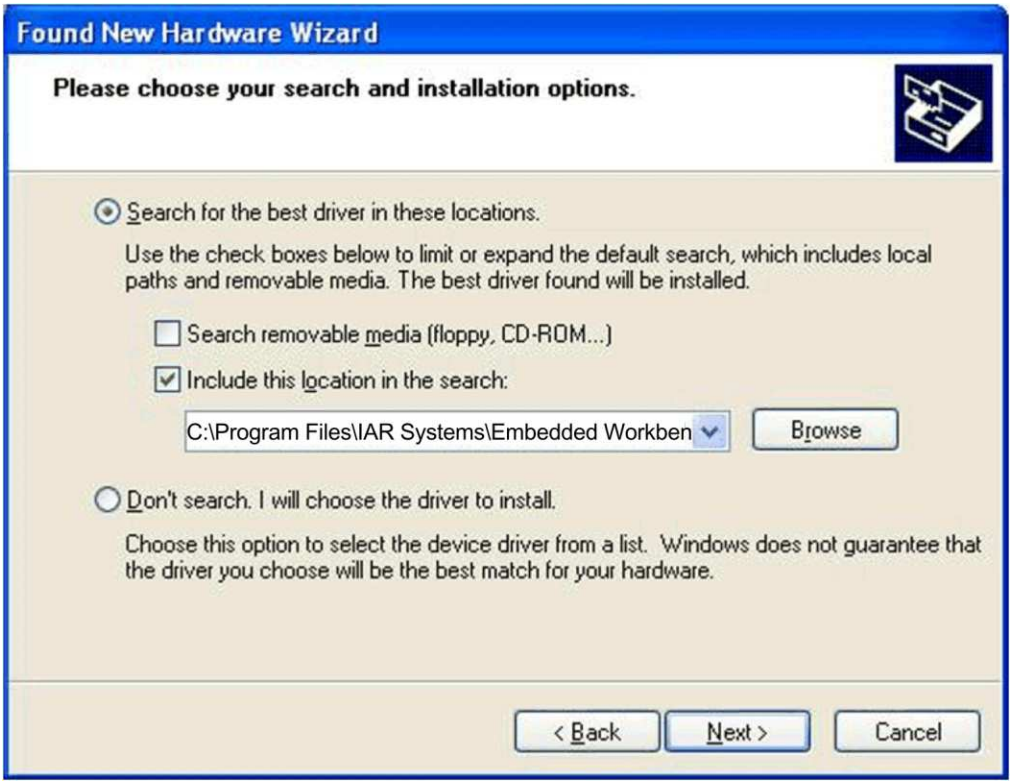
Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
C:\Program Files\IAR Systems\Embedded Workben
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

Figure C-2. Windows XP Driver Location Selection Folder

5. The Wizard generates a message that an appropriate driver has been found.

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6. The wizard installs the driver files.
7. The wizard shows a message that it has finished the installation of the software USB Debug Interface.
8. The USB debug interface is installed and ready to use. The Device Manager lists a new entry as shown in Figure C-3, Figure C-4, or Figure C-5.

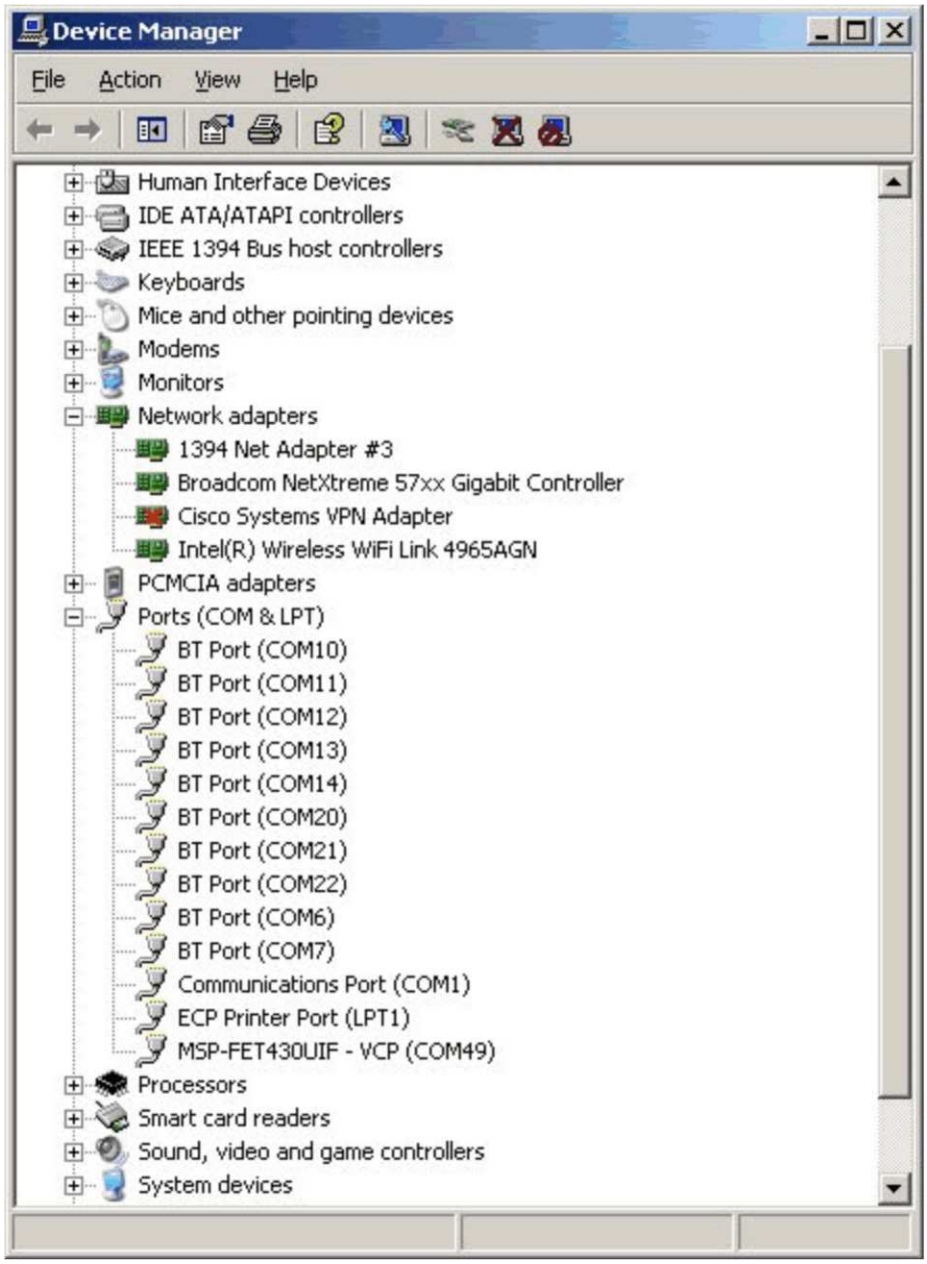

Figure C-3. Device Manager Using USB Debug Interface using VID/PID 0x2047/0x0010

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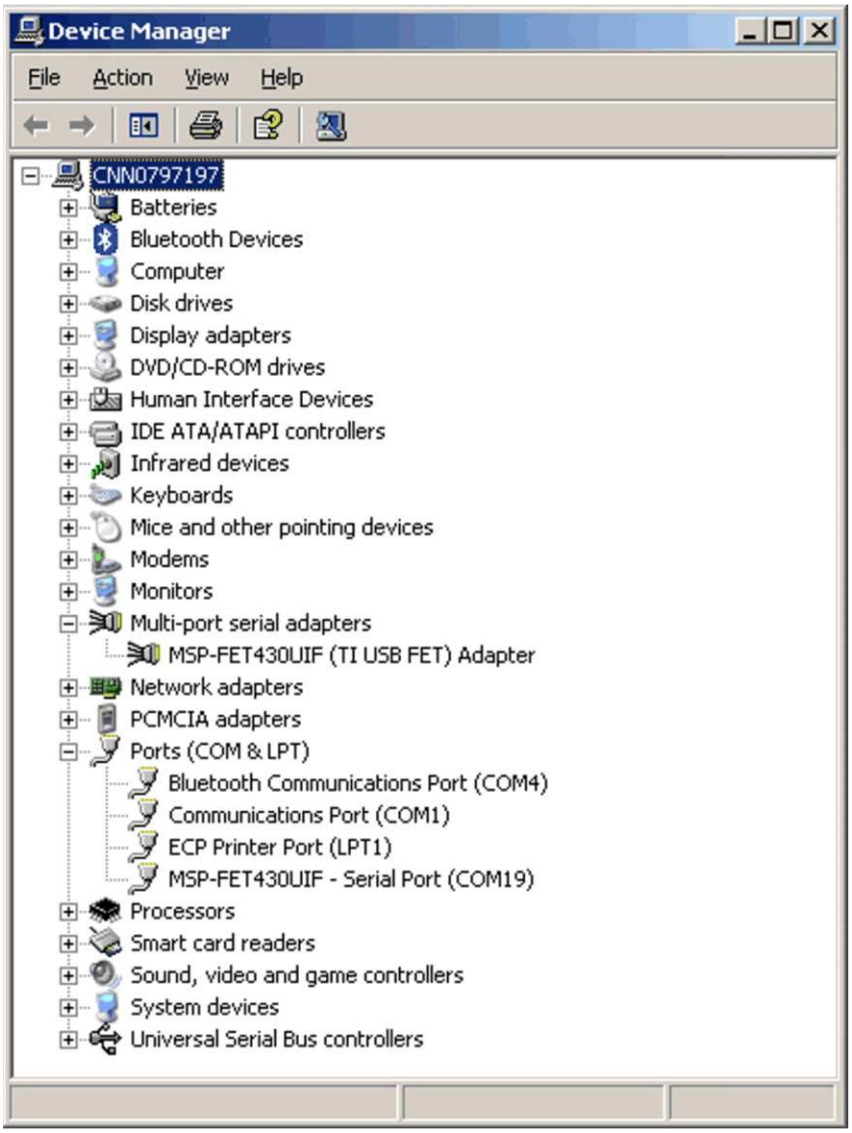

Figure C-4. Device Manager Using USB Debug Interface with VID/PID 0x0451/0xF430

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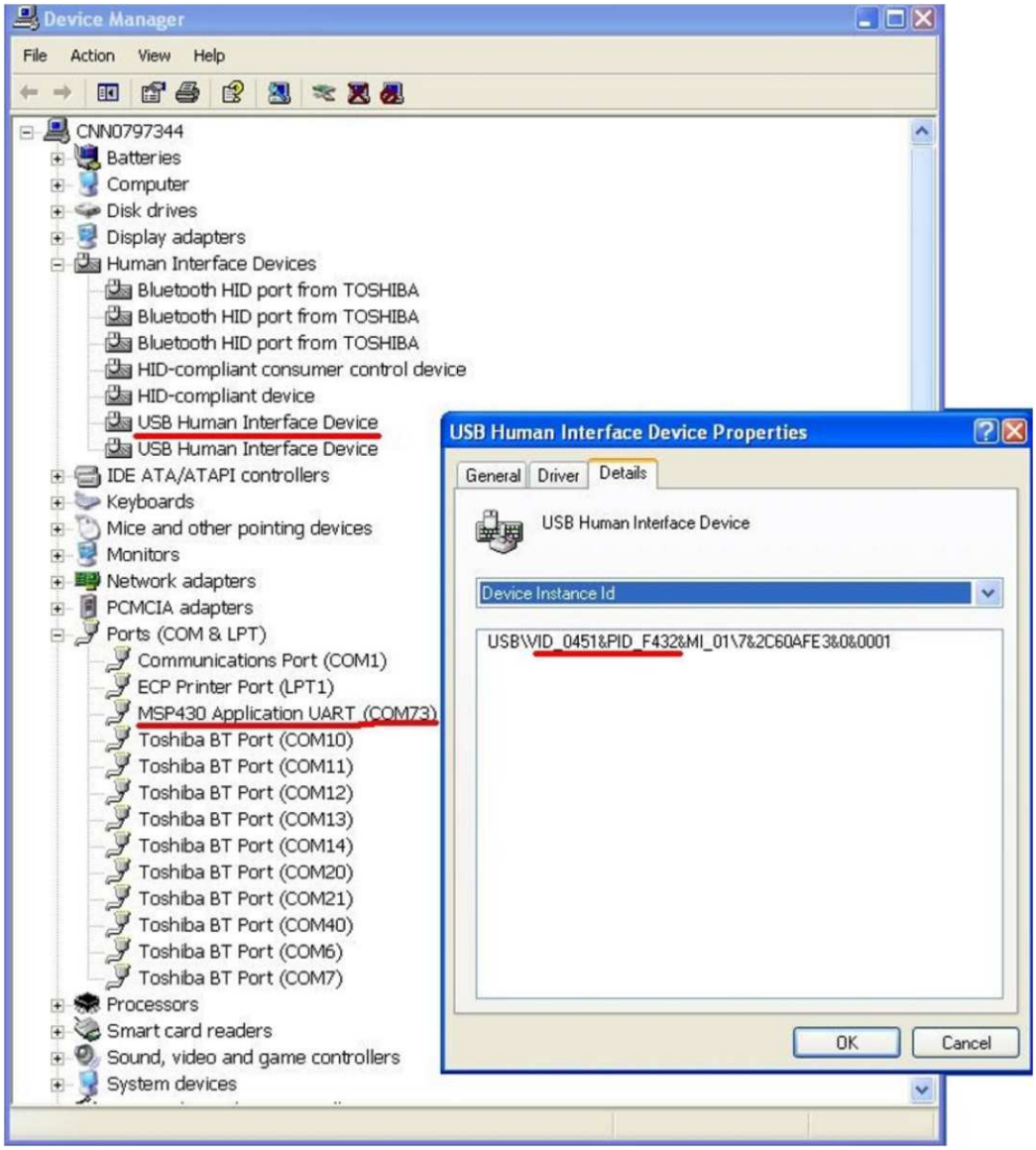

Figure C-5. Device Manager Using USB Debug Interface with VID/PID 0x0451/0xF432

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Document Revision History

Version	Changes
SLAU278	Initial release
SLAU278A	Updated USB driver installation according to CCE v3.1 SR1 and CCS v4.
SLAU278B	Added information about MSP-FET430U80USB, MSP-TS430PN80USB, and eZ430-Chronos.
SLAU278C	Added bills of materials and updated some PCBs in Appendix B. Added information about MSP-TS430DA38, MSP-TS430DL48, MSP-TS430PW14, MSP-TS430PW28.
SLAU278D	Added information about MSP-TS430L092, MSP-TS430RSB40, MSP-TS430RGC64USB, MSP-TS430PZ100USB, MSP-FET430F5137RF900
SLAU278E	Added jumper information for MSP-TS430L092 PCBs to Appendix B. Added new supported devices in Chapter 1.
SLAU278F	Added information about MSP-TS430PW24, MSP-TS430PW28A, MSP-TS430RHA40A, MSP-TS430RGZ48B, MSP-TS430RGC64B, MSP-TS430PN80A, and MSP-TS430PZ100B. Updated MSP-TS430RSB40 schematics
SLAU278G	Added information for MSP-TS430PZ100C
SLAU278H	Added information for MSP-TS430D8 and MSP-TS430RGC64C
SLAU278I	Updated Table 1-1. Replaced Figure 2-2. Added Figure 2-3. Replaced Figure B-37 and Figure B-67. Added Table C-1. Editorial changes throughout.
SLAU278J	Added EM430F6147RF900 Section B.33.
SLAU278K	Added battery pack connection information to all EM430Fx1x7RF900 kits. Added information for MSP-TS430RGZ48C and MSP-TS430PEU128. Updated Figure B-38.
SLAU278L	Changed descriptions in Section B.19 and Section B.30. Changed Figure B-60.

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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RF EMISSION TESTING

All MSP-TS430xxx kits and kits listed below have been tested for compliance with Part 15 of the FCC and Canadian ICES-003 rules. See REGULATORY COMPLIANCE INFORMATION for details on compliance with these rules. All other kits described in this document either have not been tested or have the statement in their documentation, which is listed in Related Documentation From Texas Instruments.

MSP-FET430UIF

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

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REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

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EVALUATION BOARD/KIT/MODULE (EVM)
WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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